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DIAGNOSTICS
OF
THE FUNDUS OCULI

BY

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VOLUME II

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DIAGNOSTIC CARD No. 1.

COLOBOMA OF CHOROID. (Stereo 6.)	CICATRIX OF CHOROID. (Stereo 20.)
Congenital malformation.	Results from disease or trauma.
The floor is below level of fundus.	Is level with the fundus.
Usually, a single defect.	Usually, more than one lesion.
Situated below nerve near median line.	Situated anywhere in the fundus.
Always much larger than the optic disc.	May be of any size.
As a rule the form is a vertical oval; very rarely circular.	Usually, circular or irregular in outline.
Frequently associated with coloboma of iris, nerve, or other ocular malformation.	Not associated with congenital defects.
Usually represented by relative scotoma in the visual field.	Represented by absolute scotoma.

COLOBOMA OF NERVE. (Stereo 9.)	GLAUCOMA. (Stereo 72.)
External aspect of eye is normal.	Eye presents the glaucomatous aspect.
Eye tension normal.	Eye tension increased.
Congenital malformation.	Disease of adult life.
Nonprogressive.	Progressive.
Unilateral.	Both eyes affected.
Vessels anomalously distributed but healthy.	Vessels normally distributed but usually degenerated.
Anatomic landmarks disturbed.	Landmarks not disturbed.
Lamina cribrosa not visible.	Lamina usually very distinct.
Field shows enlargement of normal blind spot.	Characteristic glaucomatous field.
No pain.	May be painful.

CONGENITAL ALBINISM OF EYE-GROUND. (Stereo 15.)	ACQUIRED ALBINISM OF EYE-GROUND. (Stereo 26.)
Congenital.	Acquired.
Associated albinism of hair, iris, etc.	Not associated with general albinism.
Photophobia. Fields normal. Under proper conditions vision nearly normal.	No photophobia. Serious impairment of vision and visual fields.
Vessels of choroid normal.	Atrophy of choroidal vessels.
Depigmentation of fundus uniform and complete.	Depigmentation irregular and incomplete.
No systemic disease present.	Suffering from systematic disease.

DIAGNOSTIC CARD No. 2.

	Exudative State of Choroiditis Disseminata (Stereo 17-18.)	**Exudative State of Angiopathic Albuminuric Retinitis** (Stereo 35.)	**Typical Cases of Central Punctate Diabetic Retinitis** (Stereo 38.)
Number and situation of lesions.	Numerous and widely distributed, but favor equatorial region. Always below level of retinal vessels.	Compartively few in number. Favorite site is posterior zone. Superficially situated; often cover the retinal vessels.	Numerous, occur chiefly in macular region. Superficially situated in front of retinal vessels.
Form and color of lesions.	Yellowish: circular, with tendency to coalesce and form scalloped patches.	Whitish, "frosty" color. Circular, with no tendency to coalesce.	Whitish, round and linear spots, which do not coalesce.
Pigmentation	A few pigmented, cicatricial spots usually present. Fresh spots may be "peppered."	No disturbance of pigment.	No pigmentation.
Blood Vessels	Retinal arteriosclerosis forms no part of choroiditis disseminata.	Arteriosclerosis usually a marked feature.	Visible vascular changes are unusual.
Hemorrhage.	No retinal hemorrhage in uncomplicated cases.	Retinal hemorrhages usually present.	Numerous, small retinal hemorrhages between spots.
Optic Nerve.	Disc may be reddened but there is no neuritis. Retinal edema may extend to nerve. (Stereo 18.)	More or less papillitis usually present.	Neuritis is unusual in this form of retinitis. Diabetic retinitis is frequently indistinquishable from other forms of angiopathic disease.

Retinitis puncatata albescens, senile "drusen" and Gunn's dots are non-inflammatory punctate conditions of the fundus not apt to be mistaken for any of the above affections.

DIAGNOSTIC CARD No. 3.

OPACITY OF RETINA DUE TO CHOROIDITIS. (Stereo 18.)	OPACITY OF RETINA DUE TO CLOSURE OF ARTERY. (Stereo 45.)
Surface slightly elevated.	Surface not elevated.
Opacity bears no relation to distribution of artery.	Fan-shaped opacity corresponding to distribution of artery.
Vessels normal or dilated.	Circulation distrubed. Artery may be sclerosed.
Gradual failure of vision.	Sudden failure of vision.
Photopsiæ.	No photopsiæ.
Usually some pigment disturbance.	No pigment disturbance.

CHORIORETINITIS PIGMENTOSA. (Stereo 22.)	RETINITIS PIGMENTOSA. (Stereo 53.)
May commence at any age.	Commences in infancy or childhood.
Not a family disease.	Reappears in a family for generations.
Night blindness appears in advanced cases.	Night blindness always presnt from onset of disease and precedes pigmentation.
May commence in any part of the fundus.	Commences anterior to equator; advances slowly backward; reaches macula in adult life 30 to 50th year.
May attack but one eye.	Invariably affects both eyes.
Development and progress may vary in the two eyes.	Develops simultaneously and progresses uniformly in both eyes.
Central vision usually affected early.	Central vision usually preserved until last stag of disease.
Diligent search usually reveals white scars in fundus.	Choroidal cicatrices never present in uncomplicated cases. Pigment uniformly distributed.
Irregular distribution of pigment.	Large percentage of cases associated with body malformations, idiocy or deafmutism.
Only associated bodily defects are stigmata in cases due to syphilis.	Progress of disease never arrested.
Disease may be arrested.	The visual fields are typical of the disease.
If central or scattered scotomata can be demonstrated, it is not a case of retinitis pigmentosa.	

DIAGNOSTIC CARD No. 4.

FOCAL TUBERCULAR CHOROIDITIS. (Stereo 23.)	EXUDATIVE CHOROIDITIS. (Stereo 17.)
Usually unilateral.	Usually bilateral.
Lesions usually confined to a limited area; *(May spread throughout the fundus).*	Widely disseminated.
Extends by development of "daughter" tubercles in proximity to original tubercle.	Appears simultaneously throughout wide areas.
Old cicatrices may be starting point of a fresh outbreak.	Cicatrices once formed remain quiet.
Surface apt to be somewhat elevated.	Surface not elevated, except when subretinal effusion and edema are present.

ALBUMINURIC RETINITIS. (Stereo 35.)	CHRONIC CHOROIDITIS. (Stereo 18.)
Occurs chiefly in posterior polar zone.	Lesions distributed throughout fundus.
White patches superficially situated; borders not pigmented; overlie retinal vessels.	White patches deeply situated; borders pigmented; always beneath retinal vessels; old patches look "punched out."
Veins dilated. Arteries normal width or narrowed. Angiosclerosis often visible.	Retinal vessels normal or may be uniformly narrowed in old cases.
Choroidal vessels not exposed.	Some choroidal vessels usually exposed.
More or less optic neuritis usually present.	Neuritis is very rare.
Retinal hemorrhage.	Hemorrhage is exceptional.
Vitreous opacities are unusual.	Vitreous opacities common in early stage.

Albuminuric retinitis is differentiated from other forms of angiopathic retinitis by diagnosticating the associated general disease.

DIAGNOSTIC CARD No. 5.

The following table applies only to typical cases.

	Simple Atrophy. (Stereo 67.)	Neuritic Atrophy. (Stereo 69.)	Retinitic Atrophy. (Stereo 22, 53)	Glaucoma. (Stereo 72.)
Color of Disc	Grey, or bluish white.	Dead white.	Dirty yellowish white.	Greenish grey, Usually darker than simple atrophy. Deep peripheral shadow.
Outline.	Sharp, regular, normal in size.	Early stage blurred; later, sharp but irregular, may appear small.	Indistinct. Normal in size.	Sharp. May appear enlarged.
Lamina Cribosa	Physiologic markings very distinct	Usually, markings are obscured.	Markings obscured	Markings very distinct.
Surface of Disc.	Normal or slightly depressed.	May be covered with opaque tissue.	Opaque tissue usually less abundant than in neuritic atrophy.	Excavated to edge of disc. Excavation commences on temporal side.
Circumpapillary Region	Unaltered	Irregularly atrophic: pigment line shoved away from margin.	Extensive chorioretinal changes usually present.	Presents a light-colored, depigmented ring, the glaucomatous halo.
Retinal vessels.	Normal. May be narrowed in very old cases.	Early stage, veins are tortuous; later, all vessels narrowed.	Vessels narrowed and degenerated.	Veins disproportionately filled; arteries narrowed; angiosclerosis; vessels pushed to nasal side; arterial pulsation if tension is very high.
Visual Fields.	In tabes concentric contraction.	Irregular or concentric contraction.	Depends on form of fundus lesion.	Peripheral contraction; begins in nasal field; also, sector defects connected with blind spot.
Course.	Progressive	Nonprogressive.	Nonprogressive unless fundus disease recurs.	Progressive.

DIAGNOSTIC CARD No. 6.

	Acute Glaucoma.	**Acute Iridocyclitis.**	**Iritis.**
Development	Acute seizure; Devlops rapidly.	Develops slowly.	Develops slowly.
Pain.	Violent and continuous; radiates through all branches of fifth nerve.	Supraorbital and temporal pain, worse at night.	Supraorbital and temporal pain, worse at night.
Cornea	Anesthetic. Parenchymatous opacity.	Usually sensitive. Parenchyma clear. Punctuate deposits on posterior surface of cornea are diagnostic.	Clear.
Anterior Chamber.	Shallow.	Usually normal or deepened.	Normal.
Iris.	Congested and discolored. No nodules.	Congested and discolored. May contain nodules, i. e. condylomata.	Congested and discolored. May contain condyloma.
Pupil.	Dilated, oval and immobile.	Contracted; may be bound to lens by synechiæ.	Contracted; is irregular after dilation with atropine; synechiæ.
Eye Tension.	Always increased.	Frequently increased.	Normal.

DIAGNOSTIC CARD No. 7.

SARCOMA OF THE CHOROID. (Stereos 74, 75.)	METASTATIC CARCINOMA OF CHOROID.
Always primary.	Always secondary.
May develop at any point.	Usually situated in posterior polar zone on temporal side of nerve.
Forms a rounded protuberance in the vitreous. Flat sarcoma **(endothelioma)** is extremely rare.	Typical appearance is a flat, oval deposit with a central elevation of one or two mm., gradually sloping into the surrounding fundus. Its color is a dirty yellow with scattered flecks of pigment.
Usually exists for many months before destroying vision.	Vision is destroyed in from two to eight weeks after appearance of eye symptoms.
Detachment occurs late if tumor is centrally located (Griffiths).	Loss of vision is due to early and extensive detachment of retina.
The pain appears to be caused solely by heightened tension.	Eye may be very painful with normal tension.
If tumor is limited to choroid, tension is not diminished.	Tension is reported as increased in one-third, normal or diminished (?) in two-thirds of cases.
Only one eye affected.	In one-third of all cases both eyes contain a carcinomatous deposit.

DIAGNOSTIC CARD No. 8.

The following table is applicable only to the early stages of glioma of the retina, at which time the diagnosis is extremely difficult and often impossible.

	Glioma of the Retina. (Stereo 76.)	**Metastatic Endophthalmitis. (Pseudoglioma.)** (Stereo 77.)
History.	May attack several children in a family. Not necessarily preceded by sickness or injury	No family history of eye tumor. Preceded by some infectious fever or by injury.
Age.	Usually discovered before the third year. Probabilities against its development after the fifth year.	May occur at any age.
Anterior Chamber and Iris.	Anterior chamber usually clear. Iris is normal and free from adhesions.	The presence of iritic adhesions, atrophy of iris, hypopyon or deposits on lens or cornea, indicates an inflammatory process rather than glioma.
Pupillary Reactions.	Early glioma affects only a limited area of retina; consequently the eye retains good light perceptions and the pupillary reactions are normal.	Metastatic retinitis usually involves the entire retina, in which case light perception may be lost and there will be no **direct** pupillary reaction.
Eye Tension	Normal or increased.	Frequently subnormal.
Detachment of Retina.	Glioma often is accompanied by simple detachment which trembles on movement; therefore, if the tumor is accompanied by simple detachment probably it is glioma.	In metastic endophthalmitis the entire retina usually is infiltrated with exudates, which render it rigid and immobile when the eye is moved.

USE OF THE OPHTHALMOSCOPE

DIRECT METHOD

By the direct method the observer looks into the eye as through an open window, and objects in the fundus are seen erect in their natural positions. The following rules should be observed in direct examination of the fundus.

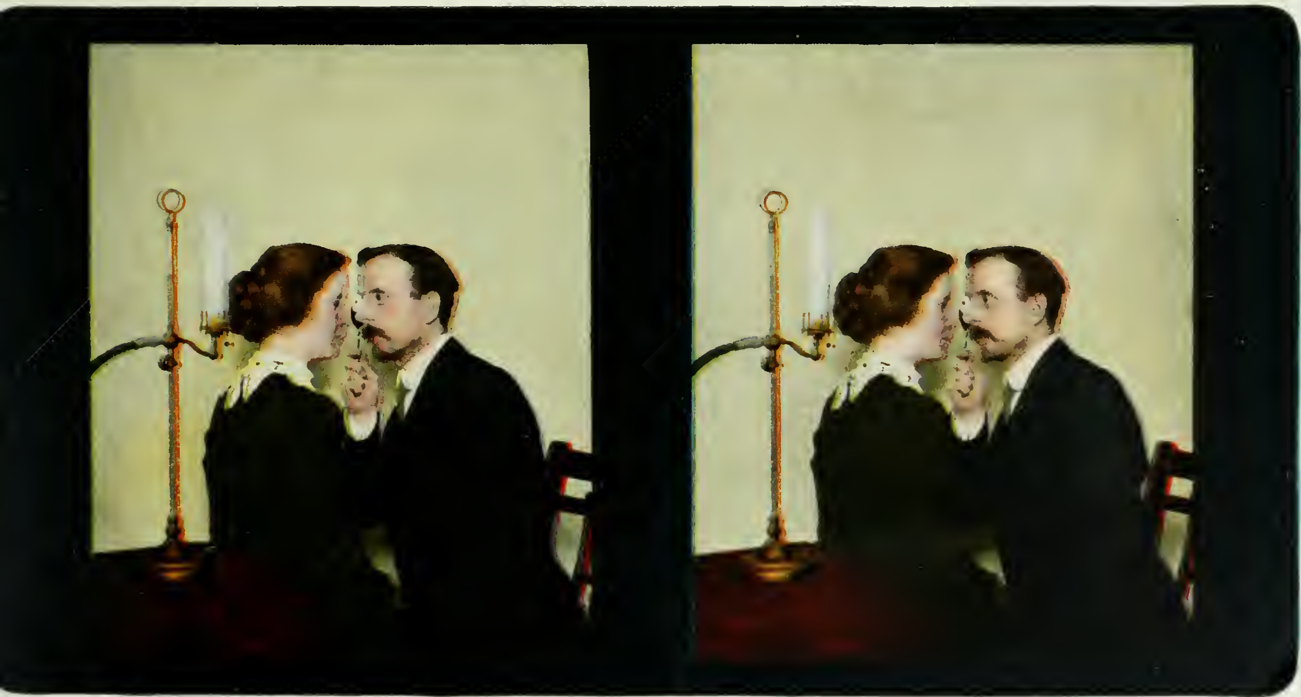
(1) In the primary position the subject's eye should be directed slightly to the nasal side, which will bring the optic disc in direct line of the observer's vision.

(2) The reflection from the ophthalmoscopic mirror casts a small, central shadow, due to the aperture. Guide the light into the subject's eye by keeping this shadow directly on the pupil.

(3) The observer must relax his own accommodation. This is accomplished by looking at the fundus picture as though it were situated at an infinite distance. If sought for close at hand, the observer exercises accommodation and the picture will be blurred. Beginners invariably violate this rule.

(4) Hold the mirror close to the subject's eye, as in this way a larger field is obtained.

Beginners in ophthalmoscopy should use the electric ophthalmoscope and employ subjects with dilated pupils. After becoming familiar with the electric instrument, reflected light may be employed.

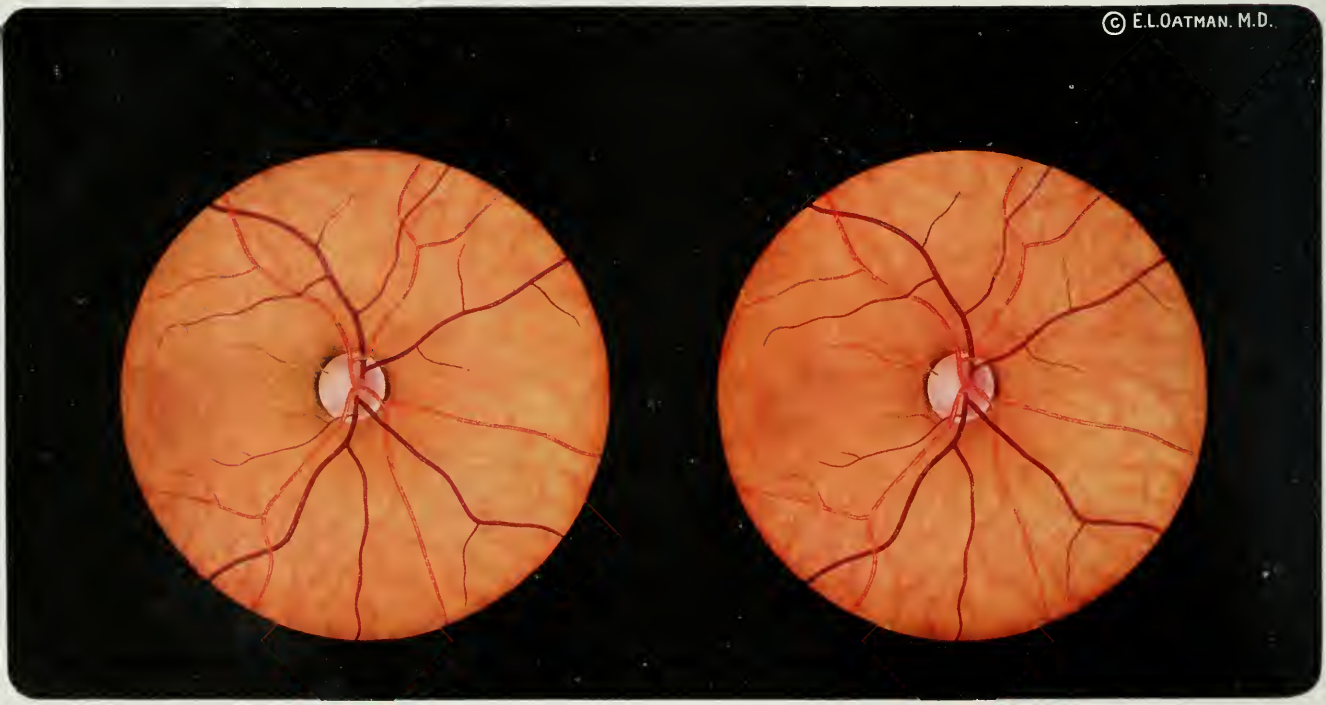


NORMAL FUNDUS OCULI

BLOND FUNDUS

RIGHT eyeground of a healthy, light-complexioned, Swedish girl. The fundus color is a bright, yellowish red, indicating that pigment is scanty in both retinal epithelium and choroid. In the macular region and around the nerve the fundus darkens. The macula exhibits a visible foveal reflex. The choroidal vessels are indistinctly outlined but may be recognized as red, anastomosing bands darker than the intervascular spaces. No vessels are seen at the macula. The optic disc is nearly circular in form and of normal color. Both choroidal and scleral ring are well defined. The retinal vessels are distributed in the most conventional manner. A small cilioretinal artery emerges from the temporal side of the disc and is directed toward the macula.

The fundus oculi comprises that portion of the eyeground which can be seen with the ophthalmoscope. In the normal eye this includes a little more than the posterior hemisphere. The ophthalmoscopic picture of the fundus is created by light reflected from the coats of the eyeball. The chief factor in its production is the choroid and, to a less extent, the retina and sclera.

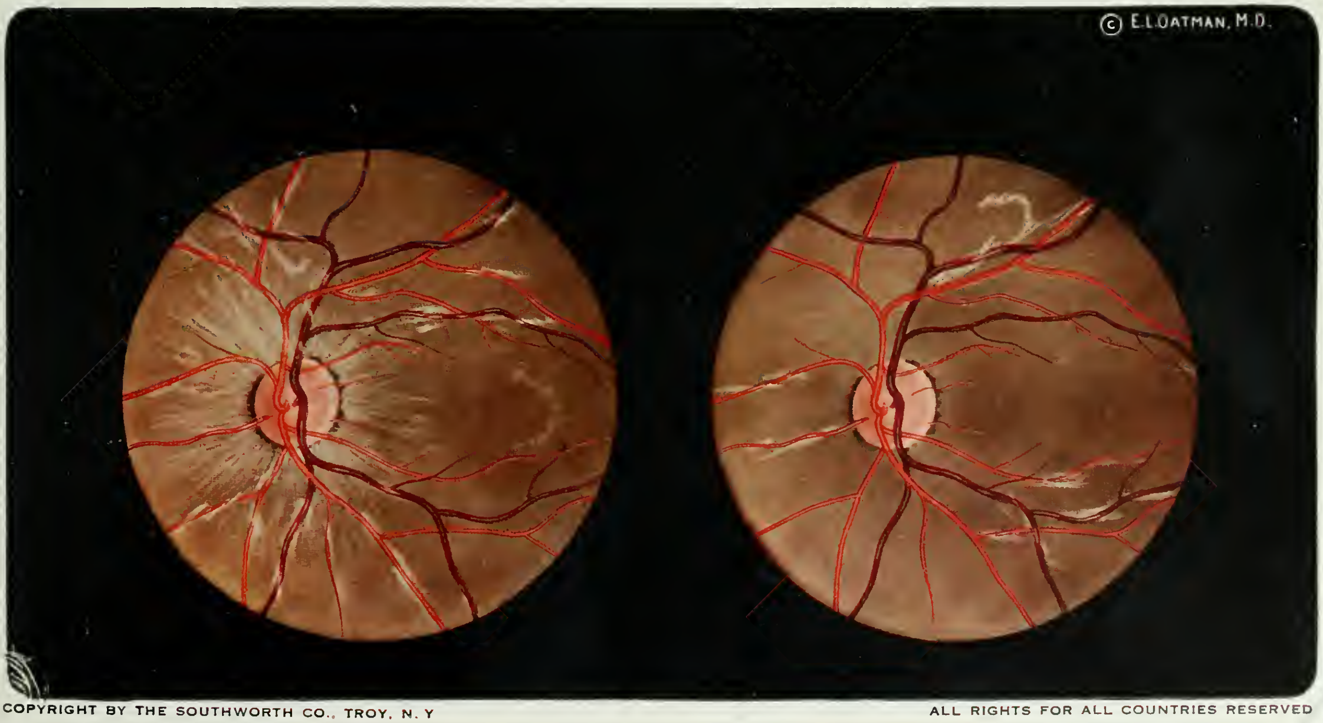


RETINAL LIGHT REFLEXES

NEGROID FUNDUS

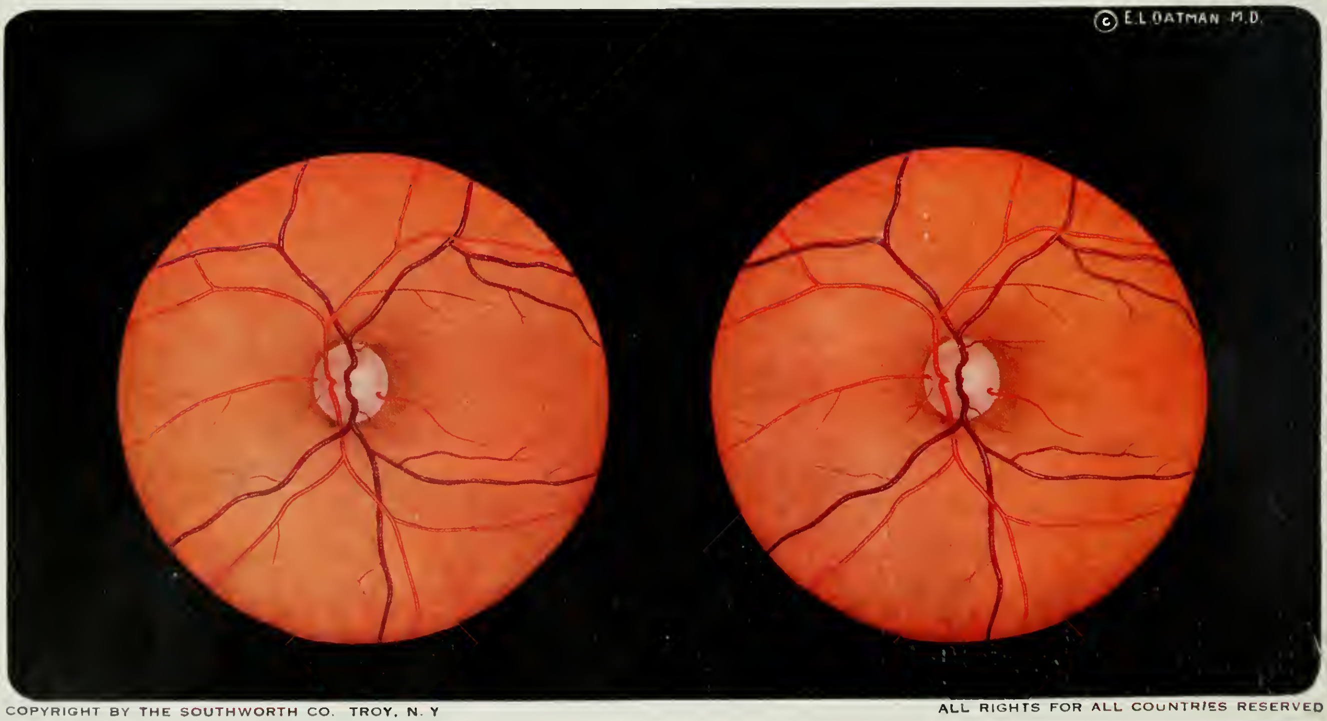
LEFT eyeground of a healthy mulatto boy, 9 years of age. The color of the fundus is characteristic of the dark-skinned races and is produced by an excess of pigment in the retinal epithelium and choroid, which obscures the choroidal reflex. The optic disc and retinal vessels are normal. This fundus is remarkable for the number and brilliancy of the light reflexes which play over its surface and along the vessels. Bright silvery rays radiate in a circle from the optic disc, corresponding in their course to that of the nerve fibers. The edge of the foveal cup is marked by a semicircle of light which changes its position with every movement of the mirror.

Visible light reflections from the retina are common but by no means constant in dark eyegrounds. They usually are seen in the eyes of children whose media, as a rule, are perfectly transparent. Retinal reflexes are best seen with a concave mirror and feeble illumination. Usually, they disappear in adult life. They are a normal phenomenon and their presence usually indicates a healthy fundus.



THE RETINAL VESSELS

LEFT eyeground of a youth in whom the retinal vessels are normal in appearance, and their method of distribution conforms to the usual scheme. This scheme is followed, in a general way, by the majority of eyes, but varies widely in individual cases. Retinal arteries are narrower than the veins and pursue a straighter course. The surface of the retinal vessels reflects a central streak of light, in the same manner as any polished cylinder. On the arteries the light streak is broad, bright and reddish in color; on the veins it is narrow, dull and white. These distinctions apply only to large and medium sized vessels, the character of a small vessel must be determined by tracing it back to its source. Retinal vessels branch dichotomously and diminish in size from disc to periphery. In this eye, as the central artery emerges from the disc, it divides into the ascending and descending papillary arteries. Frequently this primary division occurs within the nerve. The ascending artery bifurcates to form the superior temporal and superior nasal arteries. In a similar manner the descending artery divides into an inferior temporal and inferior nasal branch. The veins correspond in name and plan of distribution to the arteries.

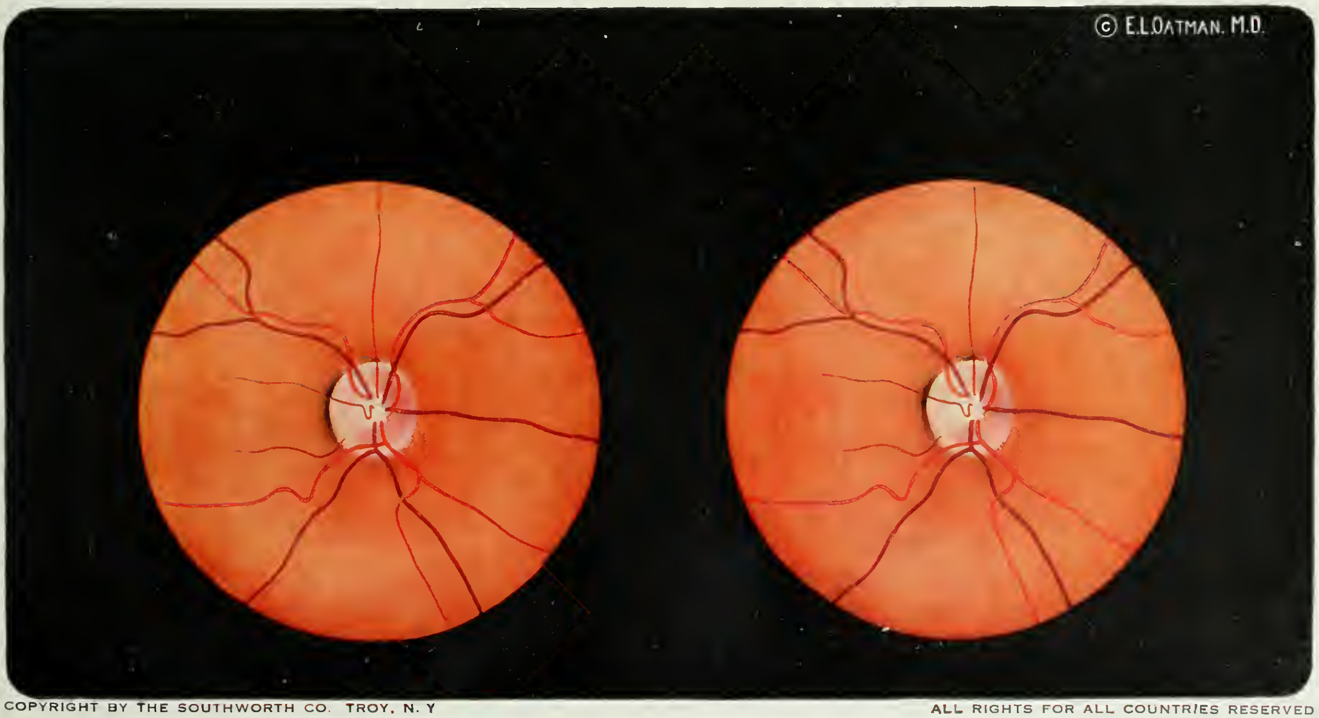


PHYSIOLOGIC EXCAVATION OF DISC

RIGHT eyeground of a boy, 12 years of age. The case is employed to illustrate the appearance of a normal disc.

The outline of the optic disc may be either circular or oval. The long diameter usually is vertical or tilted; exceptionally it lies transversely. The general color of the disc is pink, the temporal side being lighter than the nasal. The outline of the disc is softened by the overlying nerve fibers, the majority of which pass to the nasal side of the retina; hence, this side of the nerve is less distinct in outline than the temporal side and, for the same reason, the disc is darker and redder on the nasal side. Pigment from the choroid and sclera is usually massed around the disc, forming a black circle known as the *choroidal ring*. Just within the choroidal ring is a circle of white connective tissue which is said to represent the distal end of the pial nerve sheath. This is generally called the *scleral* ring from its supposed connection with the sclera. It may be partly or entirely absent. In the center of the nerve head is a depression known as the vascular funnel, a canal which transmits the retinal vessels. Usually the depression is filled with transparent tissue into which the vessels sink and appear to fade away. Not infrequently this vascular funnel is very wide, forming a clear cavity known as the *physiologic excavation.*

DIAGNOSIS: A physiologic excavation never extends to the edge of the disc as does a glaucomatous excavation (stergms. 72, 73). Those which have an oblique, funnel shape slope away from the margin in a manner quite different from the precipitous edge of a glaucomatous excavation.

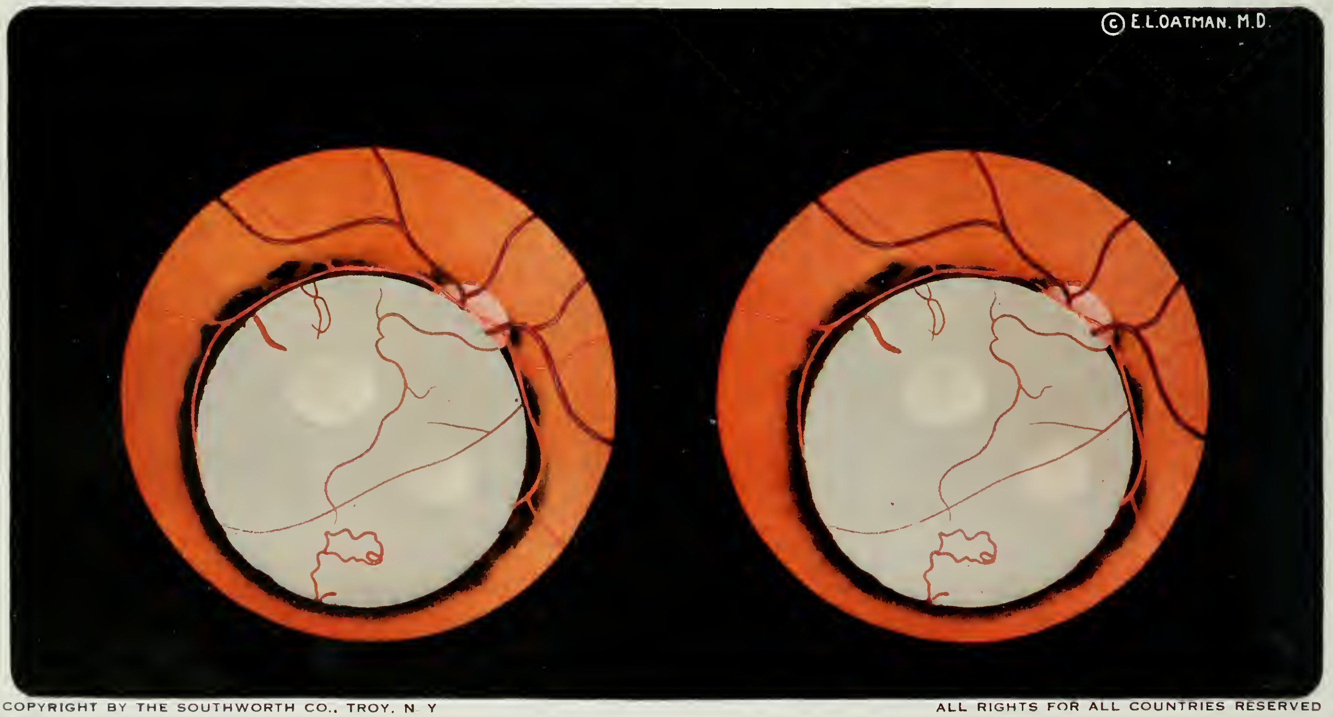


COLOBOMA OF THE CHOROID

RIGHT eyeground of a boy, 12 years of age. Left eye is normal. On his right side the patient has rudimentary auricle, paresis of the seventh nerve, coloboma of the iris, lens and choroid. Contrary to the rule, the coloboma of the choroid is nearly circular. It has a bluish-white surface and extends from the center of the disc downward and outward. The lower half of the optic disc is included in the imperfection. The coloboma forms a crater-like depression about 2 mm. below the normal level of the fundus. The adjacent fundus is strongly pigmented. On the floor of the depression are two small oval ectasiæ. The retinal vessels make wide detours, skirting along the margin of the coloboma as though they had been pushed aside. The defect is covered by retinal tissue, as shown by a medium sized retinal vessel which crosses from above, downward and outward. The branching vessel which enters the coloboma through the floor above is probably a ciliary artery, while the vascular loops which push in along the edge are from the neighboring choroid.

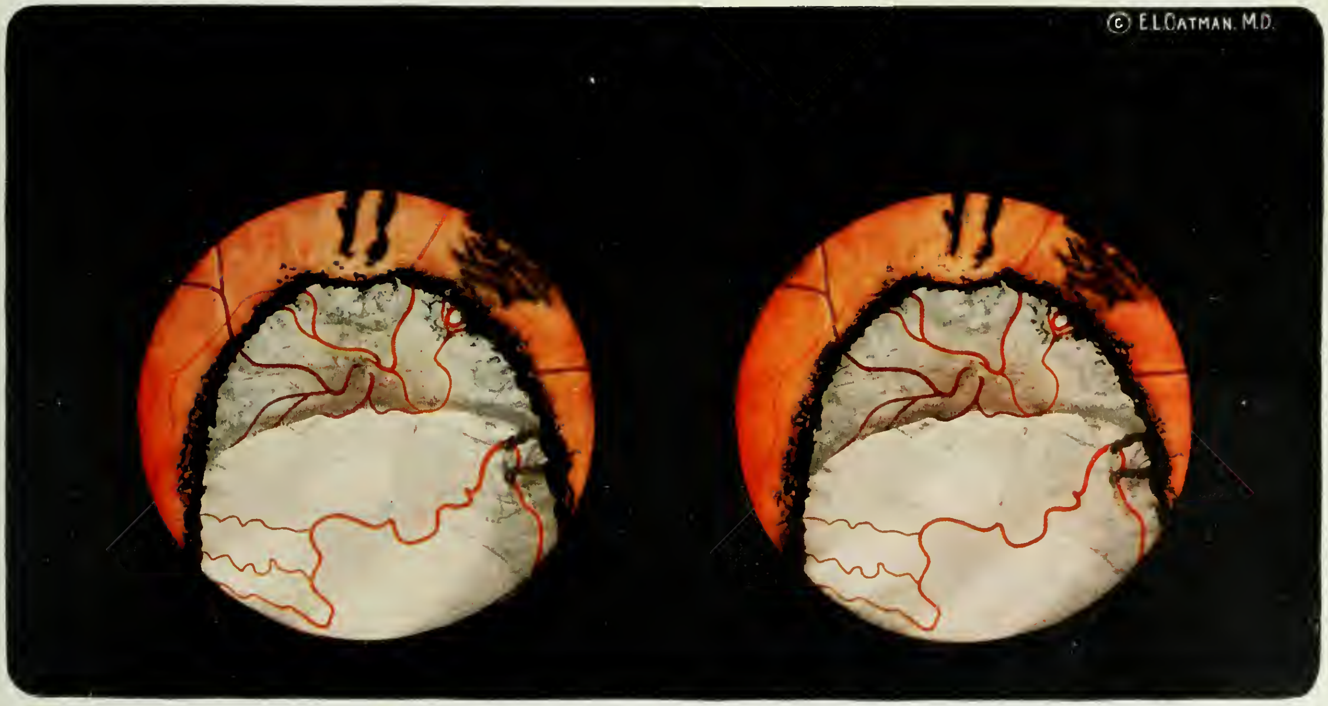
Diagnosis: Large colobomata are unmistakable. The smaller ones may be mistaken for choroidal cicatrices. (See diagnostic card No. 1.)

In typical rupture of the choroid a crescentic area of sclera is exposed concentric with the outline of the disc.



COLOBOMA OF CHOROID AND NERVE

RUSSIAN girl, 11 years of age. Right eye normal. Left eye presents an enormous coloboma of the choroid, which includes the lower third of the fundus, the optic nerve and the macula. Its anterior extremity extends beyond the limits of the ophthalmoscopic field. The edge of the coloboma is sharp cut as though the choroid had been punched out with a die. The defect is framed by a border of dense pigment, and pigment anomalies are seen in the surrounding fundus. The floor of the coloboma is about 1 mm. (3 D.) below the level of the fundus. Its surface is broken by pits and channels. The entire coloboma is covered with loose, web-like tissue, evidently imperfectly formed retina. Posteriorly this tissue is thick and contains retinal vessels; anteriorly, it is tenuous and transparent. Filmy membranes and dense tangles of tissue containing pigment extend out from the margin, and web-like bands stretch across the gap. The optic disc is not apparent, but its site is indicated by the retinal vessels which converge to a point in the dense tissue of the coloboma. These vessels can be traced from their origin, across the pigmented border, out into the retina. In the lower part of the coloboma, the large vessel which emerges from the pigmented border and extends across the pit is known, from its manner of branching, to belong to the choroid.

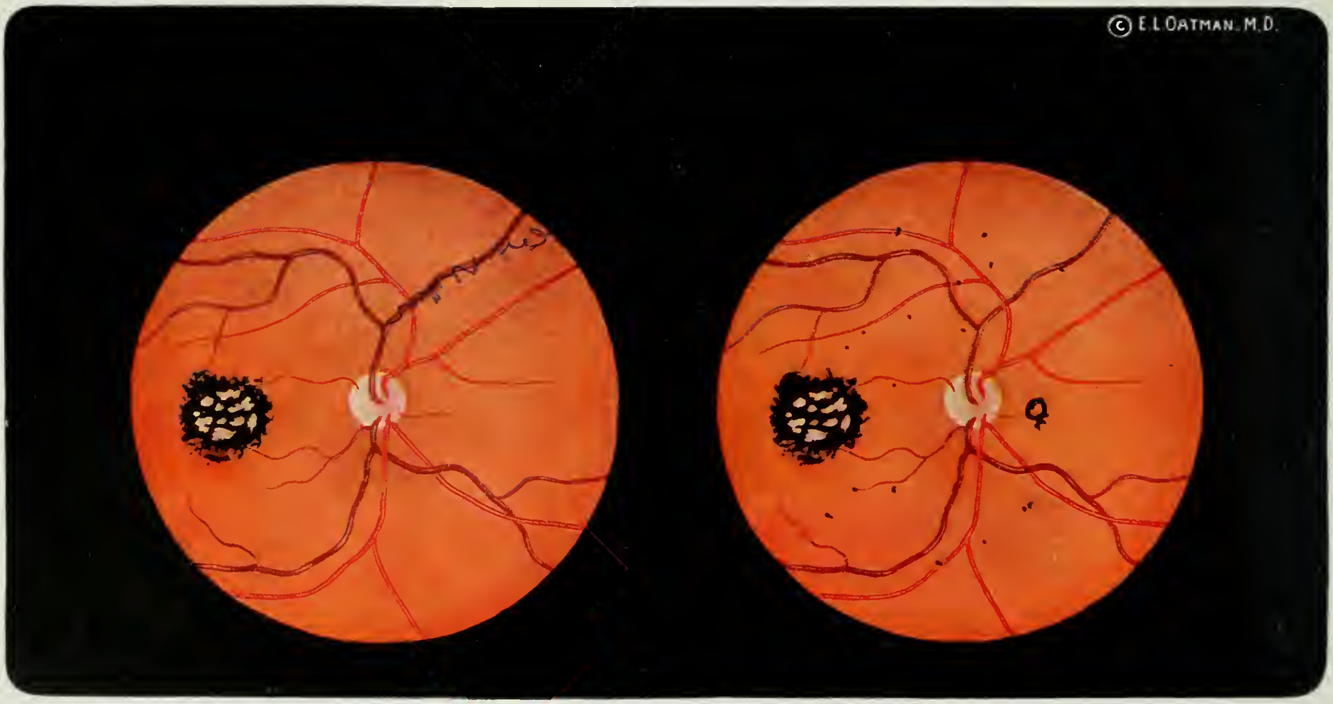


COLOBOMA OF THE MACULA

RIGHT eyeground of a girl, aged 16 years. Left eye normal in all respects. Right eye has no central light perception. The macular region is occupied by a horizontally oval defect, of about twice the diameter of the disc, evidently a coloboma of the choroid. The fundus contains no other imperfection or evidence of disease. The floor of the coloboma consists of bluish-white sclera and is depressed below the level of the fundus. Dense masses of pigment encircle the defect and cross its surface.

The great majority of choroidal colobomata follow the line of the fetal cleft. The most common atypical coloboma occurs at the macula.

Diagnosis: Natal hemorrhages or rupture of the choroid may result in cicatrices that cannot, with certainty, be differentiated from congenital coloboma. An associated coloboma of the iris is the best evidence that a choroidal defect is a malformation and not a cicatrix. True colobomata usually, if not invariably, are depressed below the normal level of the fundus. Cases in which the eye contains other lesions, especially those of chorioretinitis, cannot be accepted as genuine. A colobomatous eye may rotate on its antero-posterior axis (torsion); therefore, the position of the eye should be determined before deciding that the direction of a coloboma is atypical.



COLOBOMA OF OPTIC NERVE AND SHEATH

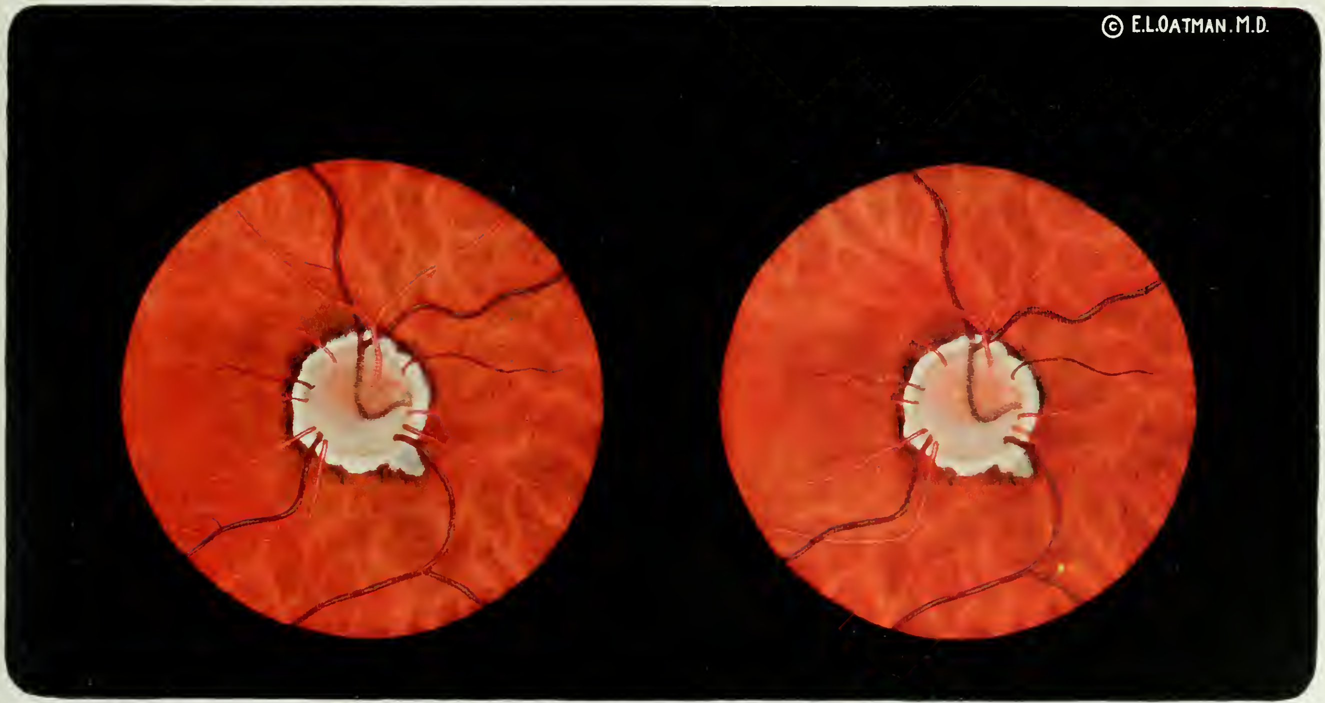
RIGHT eyeground of a woman, 27 years of age. Vision is 20/50. The ophthalmoscope reveals a colobomatous formation involving the optic nerve. The area of the disc appears greatly enlarged and depressed. The depression is surrounded by a white zone of exposed sclera, level with the surrounding fundus, from which it is separated by a ring of black pigment. The pit of the coloboma is shallow above and gradually slopes downward and backward, terminating below in a pouch-like cavity, resembling a glaucomatous excavation, into which the vessels dip and disappear. Details are indistinct owing to a semi-transparent tissue which fills the depression. The surface of the coloboma may be divided into three parts as follows:

1. The nervehead, represented by an oval, pinkish disc, situated above;

2. The surrounding floor and walls of the pit which possess a bluish-white color and represent a defect in the scleral canal and sheaths of the nerve (coloboma of the nerve sheaths);

3. The white zone and pigment ring. The line of pigment marks the limit of the choroid; therefore, the white zone is a defect or coloboma in the choroid.

Diagnosis: A large coloboma of the nerve or nerve sheaths cannot well be mistaken for any other condition. A small coloboma, however, limited to the nerve may present a superficial resemblance to glaucomatous excavation. (See diagnostic card No. 1.)



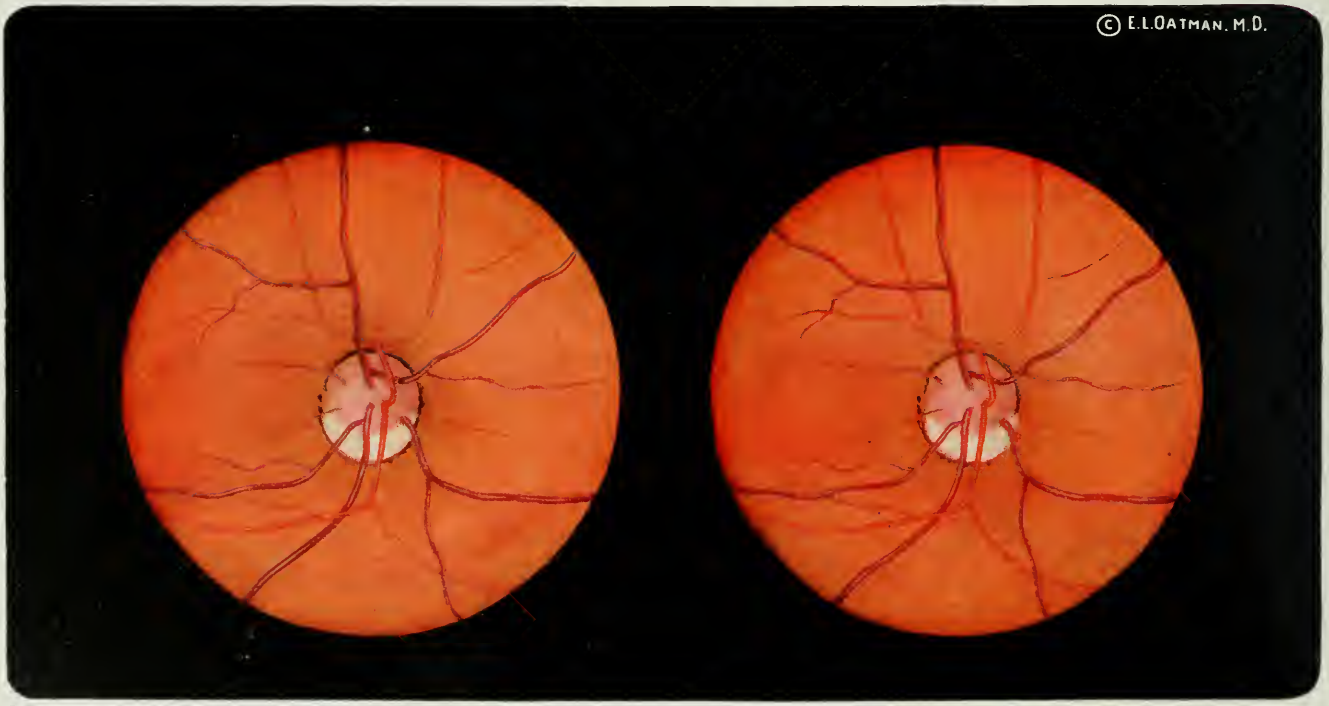
INFERIOR OPTIC CRESCENT

CONGENITAL CRESCENT; INFERIOR STAPHYLOMA

RIGHT eyeground of a girl, 19 years of age. Similar conditions exist in both eyes. Has hyperopic astigmatism. With correcting glasses the vision remains slightly subnormal. The optic disc presents the only abnormality in the fundus. The nerve head is reddened. Adjoining the disc below is a broad, white crescent. The crescent is not depressed and the retinal vessels cross its surface without bending. The pigment which surrounds the top and sides of the optic disc is continued around the crescent, so that the latter appears to form part of the nerve head.

The above description is applicable to all well-developed cases of congenital, inferior conus. A conus may appear around any portion of the nerve, but the great majority are directed downward. A physiologic excavation of the nerve always opens toward a conus when the two conditions are associated.

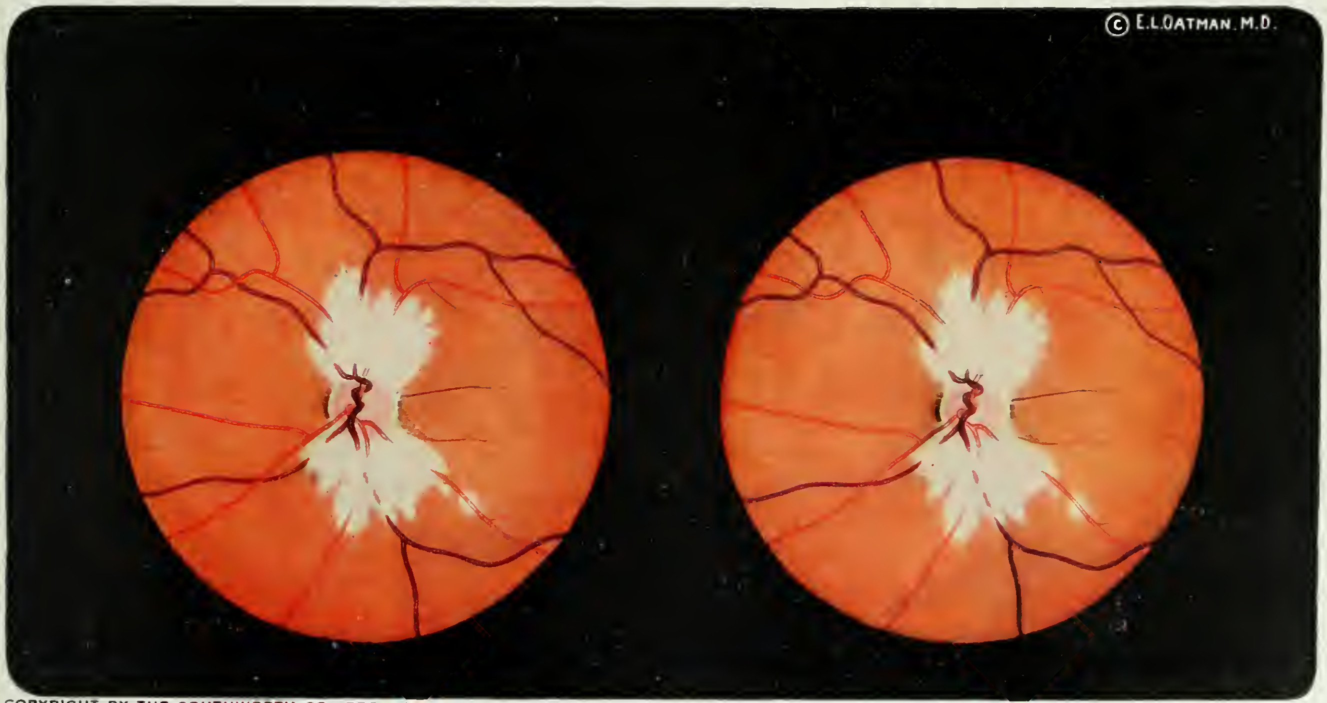
Diagnosis: Congenital crescent bears a resemblance to the myopic crescent, but differs in the following respects: myopic crescent develops on the temporal side of the nerve, occurs only in myopic eyes and is progressive. Congenital crescent occurs below the nerve, usually in eyes with astigmatic and hyperopic errors of refraction and subnormal vision; it is non-progressive.



OPAQUE, OR MEDULLATED NERVE FIBERS

EXTENDING into the retina from the upper and lower margins of the disc are large, white, striate patches terminating in delicate filaments, resembling brush strokes of white enamel. These patches are typical opaque nerve fibers. Additional fibers are scattered along the inner and outer margins of the nerve, and a solitary wisp is observed around the inferior temporal artery. These fibers become opaque first near the periphery of the disc. They pass behind and in front of the retinal vessels, obscuring or completely hiding them. Although the vessels appear embedded in solid tissue, their circulation is in no way disturbed. The disc appears reddened, but this is an artefact produced by contrast with the brilliant, white nerve fibers.

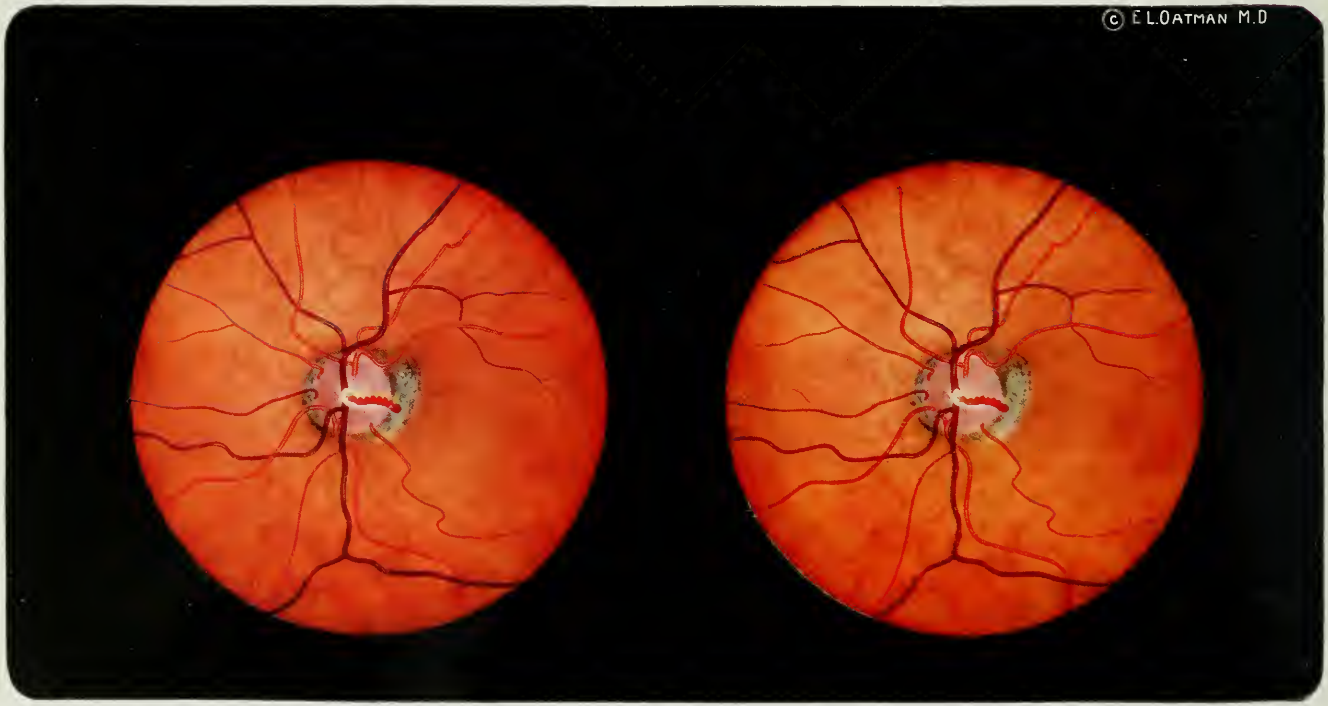
Diagnosis: Opaque nerve fibers, especially when disconnected from the disc, are apt to be mistaken for a manifestation of disease. They are recognized by their brilliant white color, filamentous structure, radial direction, and by the manner in which they run over and under vessels without affecting the circulation. The striations around a choked disc are not so white or well defined and they are accompanied by swelling of the nerve, engorgement of veins, hemorrhage and edema. Opaque nerve fibers are readily differentiated from choroidal patches by their superficial situation, striate edges and form. In albuminuric retinitis small, fluffy, striate exudates may occur between the nerve fibers but the fundus contains other evidence of disease. Retinal light reflexes (stergm. 3) differ from opaque nerve fibers in that they are widely distributed and appear and disappear on changing the position of the mirror.



PREPAPILLARY RETINAL ARTERY

LEFT eyeground of a boy which, among other physiologic variations, presents a beautiful vascular anomaly. Retinal and choroidal pigment is scanty throughout the fundus. The region around the disc, which usually contains an excess of pigment, is almost completely depigmented. A curious "pseudoconus" exists on both sides of the nerve. The eye is hyperopic and, as is common in hyperopia, the retinal vessels are rather tortuous. Three vessels which emerge from the margin of the disc, hook over its edge in a manner characteristic of cilioretinal arteries. The most striking feature in the fundus is a vascular loop, twisted like a rope, which projects from the disc into the vitreous for a distance of 2.6 mm. (8. D.). It originates close to the central vein but probably is an artery. The base of the loop is enclosed in connective tissue. The loop undergoes strong, systolic pulsations during which its anterior extremity rises in the vitreous and the entire coil appears to elongate.

Diagnosis: Preretinal vessels usually are mistaken for persistent hyaloid vessels and canal (stergm. 14). The two anomalies differ essentially. The preretinal artery is a well formed vessel which, after its excursion into the vitreous, returns to the nerve and presents the appearance of having always pursued the same course. The hyaloid artery is primarily distributed to the fetal lens and after incomplete absorption it does not possess the finished circulatory connections of a prepapillary loop. So-called persistent, hyaloid arteries consist most frequently of remnants of the hyaloid vascular sheath, the artery itself being absent or forming but an insignificant part of the structure.



PSEUDONEURITIS

RIGHT eyeground of a healthy man, 27 years of age. Has a high degree of hypermetropia in both eyes. With correcting glasses vision is normal. The fundus is darkly stippled. The nerve head is uniformly reddened and elevated about 0.66 mm. (2. D.). By the direct method of examination the margin of the disc is indistinct, but examined by the indirect method the outlines become sharp. Both arteries and veins are very tortuous, but the arteries are not disproportionately narrower than the veins. All vessels are uniformly broadened, presenting neither the local constriction nor dilations that occur in inflammatory congestion. There are no hemorrhages or exudates in the retina. The fundus condition is stationary. Diagnosis is pseudoneuritis in a hypermetropic fundus.

Diagnosis: Mere redness of the nerve, however marked, does not warrant a diagnosis of inflammatory hyperemia, unless some of the following conditions coexist:

(a) Hyperemia greater than previously existed in the affected eye or now exists in the fellow eye;

(b) Redness which extends into a physiologic excavation;

(c) The outline of the disc is blurred by both direct and indirect methods;

(d) Small vessels on and around the disc increased in numbers;

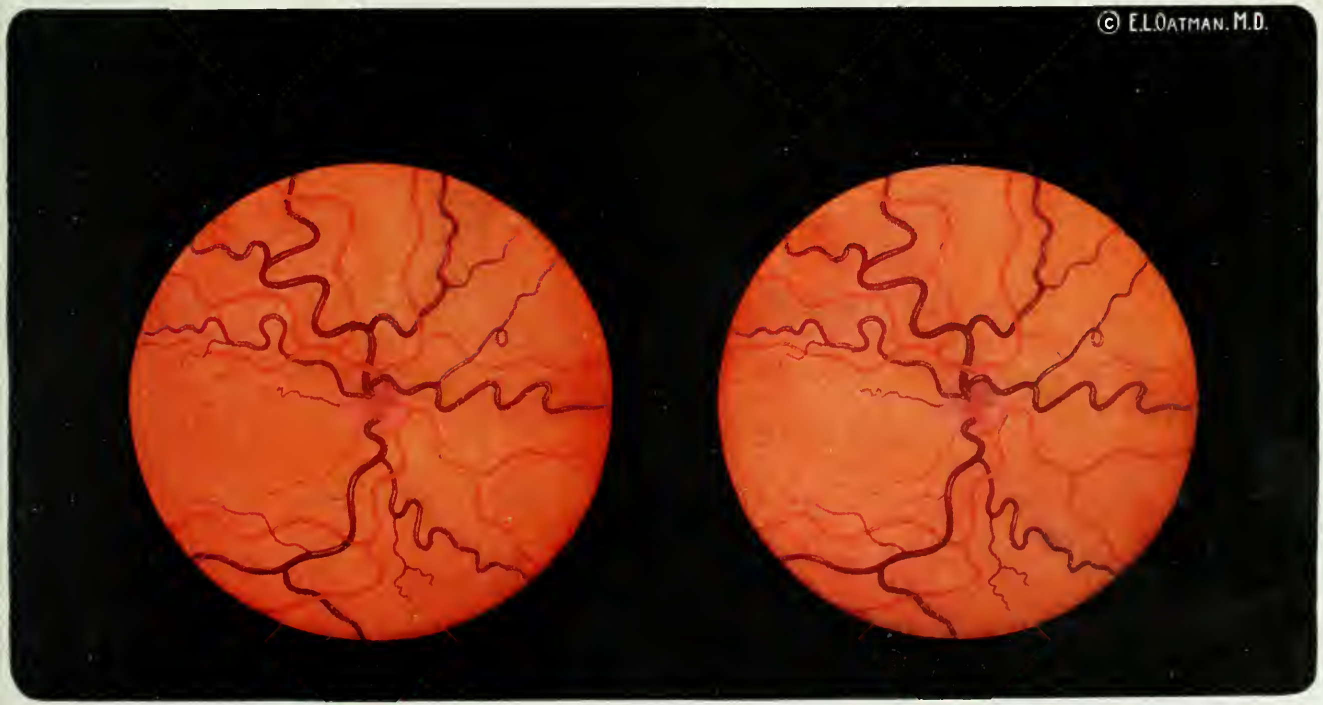
(e) Veins enlarged and tortuous, with arteries straight and narrowed;

(f) Individual vessels exhibit dilations and constrictions;

(g) Lymph stasis in perivascular sheaths manifested by light lines along vessels, on and near the disc;

(h) Absence of high hypermetropia and astigmatism.

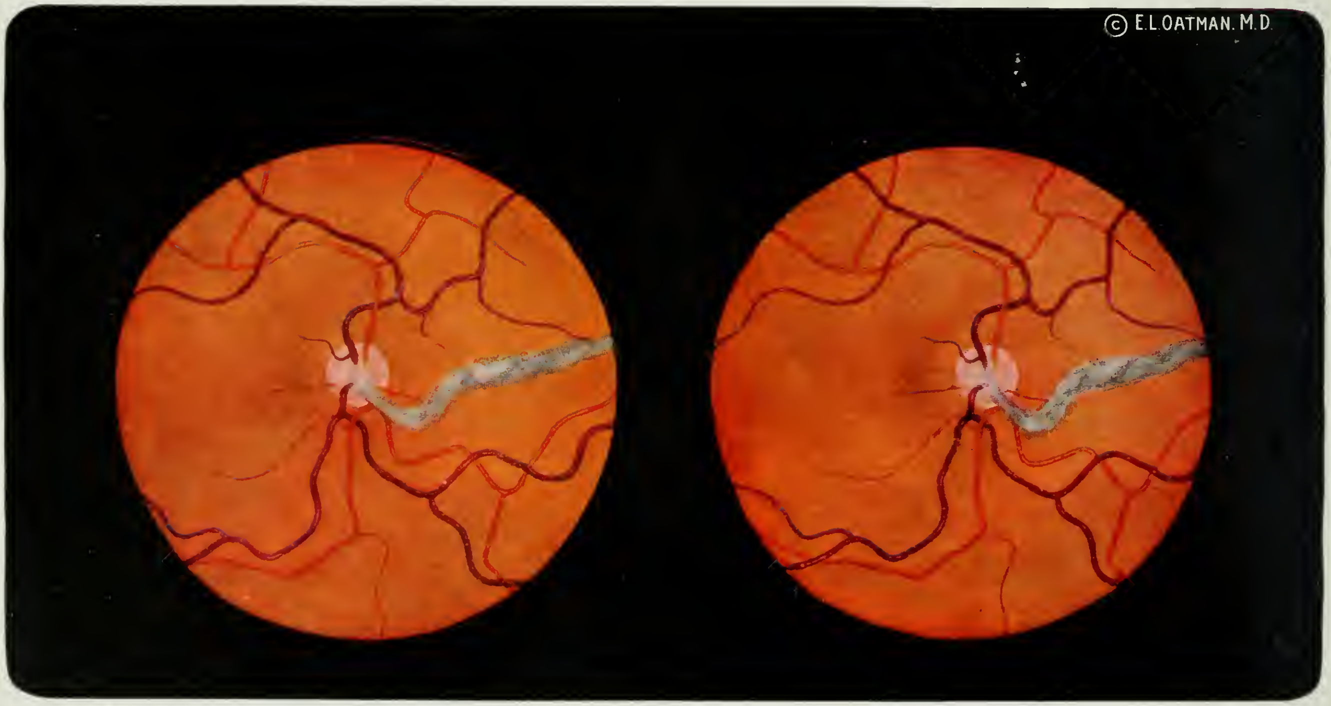
True neuritis does not commence with diffuse redness, but with distinct edema and blurring of the nasal side of the disc and adjacent retina (stergms. 31, 65).



PERSISTENT CANAL OF CLOQUET

RIGHT eyeground of a girl, aged 13 years. Left eye normal. The only abnormality observed in the right eye is a bluish-white cord extending from the center of the disc far into the vitreous, terminating in a number of filaments which are not shown in the picture. Its anterior extremity is seen best with a plus lens of 16 D. The slightest movement of the eye causes active oscillatory motions in the cord, but its excursions are of limited extent. No blood vessels are visible on its surface. Evidently, the formation is a congenital anomaly, clinically known as persistent hyaloid artery or canal of Cloquet.

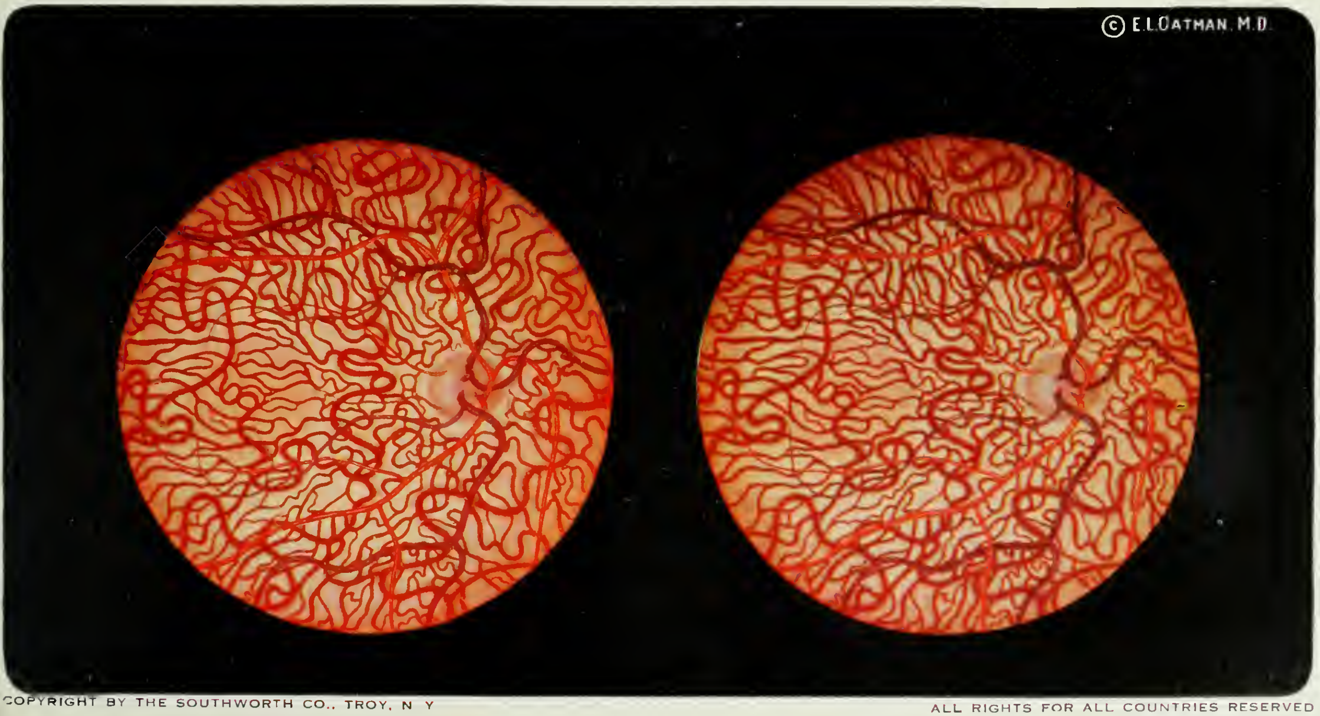
Diagnosis: Everbusch does not regard differentiation of membranous and vascular structures in the axis of the vitreous as easy, and separates such formations into two classes: (1) True persistent hyaloid artery; (2) Membranous opacities in the hyaloid canal, probably the residuum of a hemorrhage. For the diagnosis of persistent hyaloid artery it is necessary for the vessel to arise from the arteria centralis retinæ and be filled with blood. Greeff diagnosticates persistent hyaloid artery when the cord is connected with the central artery and with the posterior pole of the lens, or else the anterior extremity terminates in numerous branches. He further diagnosticates visible Cloquet's canal when the formation has a funnel shape and the contents are opaque. The membranes of retinitis proliferans, usually, are too widely distributed to be mistaken for fetal remnants (stergm. 61). Prepapillary artery frequently is miscalled persistent hyaloid (stergm. 12). It is distinguished by its completed structure, perfect circulation and by its origin and termination in the disc.



ALBINISM OF THE EYEGROUND

EYEGROUND of an albino girl, 14 years of age. The ophthalmoscopic picture is that of an exaggerated blond fundus in which the normal pigment of the eye is absent. The background of the fundus has a pinkish-white color produced by the white sclera shining through the capillary layer of the choroid. The optic disc is of normal color but appears dark from contrast with the white fundus. The blood vessels form a beautiful red tracery against the pink-white sclera. The retinal vessels lie in front of the choroid and are recognized by their rounded form and terminal manner of distribution. The choroidal vessels are sharply defined, have a ribbon-like appearance, possess no central streak and anastomose freely with each other.

DIAGNOSIS: Congenital albinism of the fundus associated with general achromatism is unmistakable. Pathologic depigmentation of the eyeground, however, does occur and the ophthalmoscopic picture which results closely resembles that of the albinotic eye (stergm. 26). The only case I ever saw occurred in a diabetic.

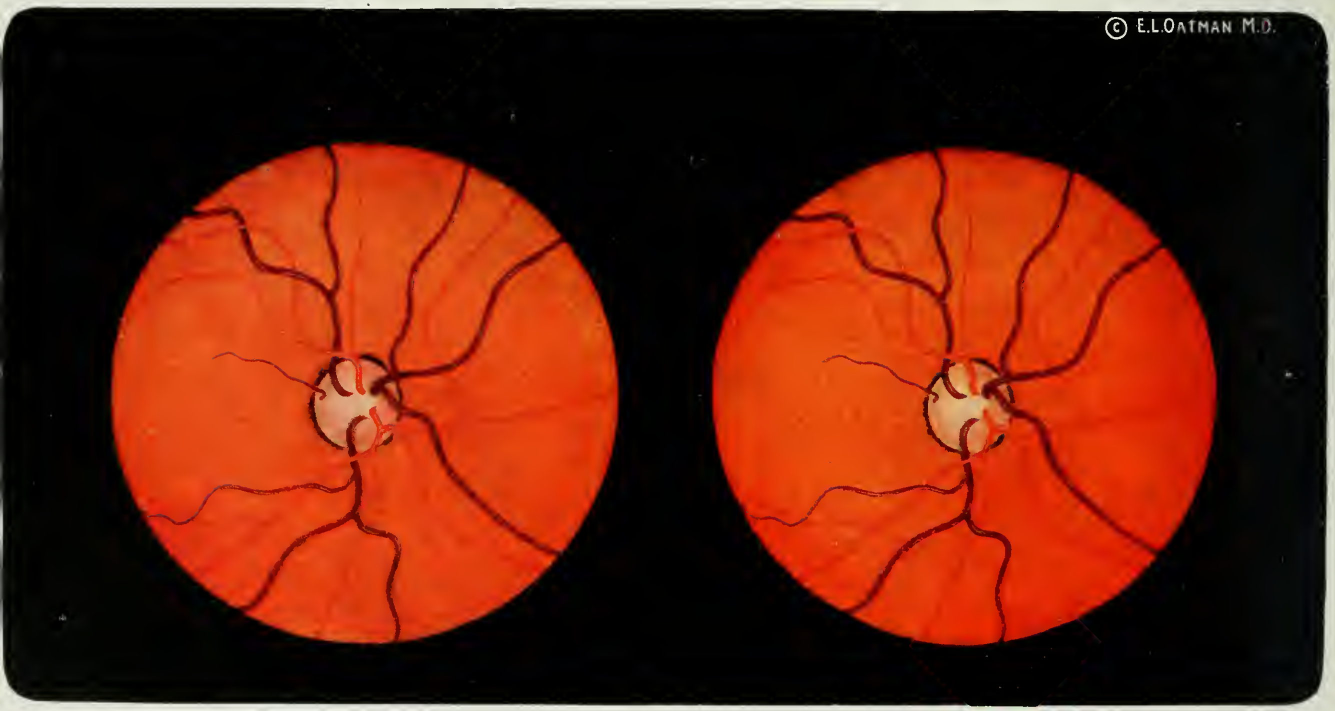


PUNCTATE CONDITION OF THE FUNDUS

SYNONYMS: GUNN'S DOTS; CRICK DOTS

RIGHT eyeground of a healthy housemaid, 20 years of age. Fundus conditions are identical in both eyes. With correcting glasses vision is normal. The macula and surrounding fundus contain numerous groups of very pale dots, situated on the surface of the retina. The nearer to the fovea, the more distinct are the dots.

Diagnosis: Although unusually numerous, these spots are considered as examples of the nonpathologic condition described first by Marcus Gunn. A diagnosis of Gunn's dots should be made only in eyes that are perfectly normal; never where deterioration of vision has occurred. Central choroiditis (stergm. 19) is distinguished by the greater size and distinctness of the spots and by visual disturbance. Colloid excrescences (stergm. 27) usually occur in the aged; they are more widely distributed and more distinct than Gunn's dots. Minute, isolated, glistening specks are sometimes observed in the normal fundus. They occur at all ages and in any part of the eyeground Their brilliant metallic lustre is sufficient to differentiate them.

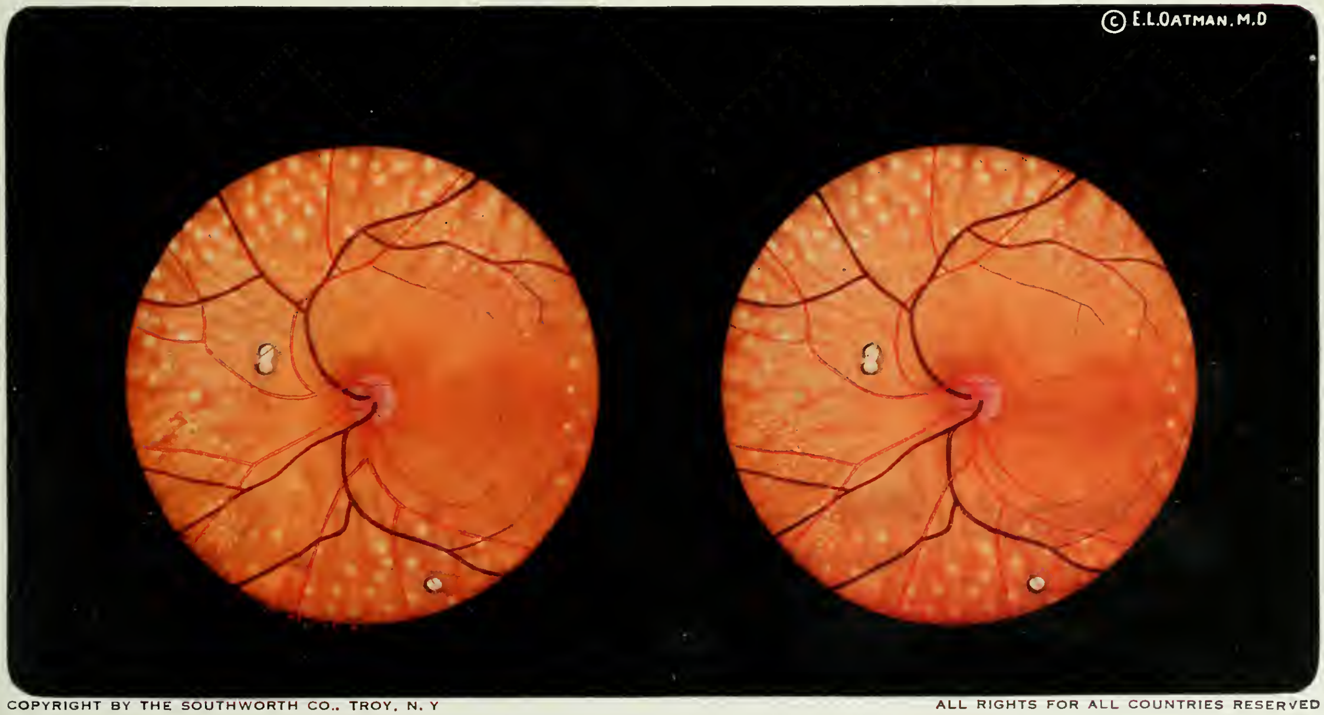


CHOROIDITIS DISSEMINATA

EXUDATIVE STAGE: STAGE OF ERUPTION

RIGHT fundus oculi of a woman, aged 32 years. No evidence of either syphilis or tuberculosis. Both eyes equally affected. Vision 20/40. Flashes of light and a "glimmering" sensation are experienced. The ophthalmoscopic picture is that of early choroiditis disseminata. The fundus, especially the equatorial region, is covered by an eruption of discrete, round, softly outlined, reddish-yellow spots, situated below the level of the retinal vessels. The spots vary in size from the diameter of a primary retinal vessel to one-fourth that of the disc. At certain points they occur in thickly crowded clusters. In this early stage of the disease the spots show but slight tendency to coalesce and their borders are not pigmented. Two older cicatricial spots are seen, bordered by pigment. Although the patient is a brunette, the entire fundus is light in color and the choroidal vessels are plainly seen, indicating slight, general depigmentation of the retinal epithelium. The retina is transparent and the vessels normal. The optic disc is reddened, presumably due to hyperemia of the choroid, which has extended to the head of the nerve through the anastomosing vessels of Zinn.

Diagnosis: Choroiditis in the exudative stage requires differentiation chiefly from angiopathic retinitis. In choroiditis the spots are yellowish in color, situated below the retinal vessels, and some pigmentation usually is present. In retinitis, on the contrary, the spots have a whitish color, are superficially situated, often in front of the vessels, and are not accompanied by pigmentation. The lesions of choroiditis are numerous and widely distributed, while those of retinitis are few in number and usually appear at the posterior pole. Vascular degeneration, retinal edema and hemorrhage which occur in retinitis are very unusual in choroiditis. The disc may be reddened in choroiditis, but actual neuritis, so common in albuminuric retinitis, does not usually occur. The subjective symptoms of choroiditis, *i.e.*, photopsiæ, metamorphopsiæ and chromotopsiæ are exceptional events in angiopathic retinitis.

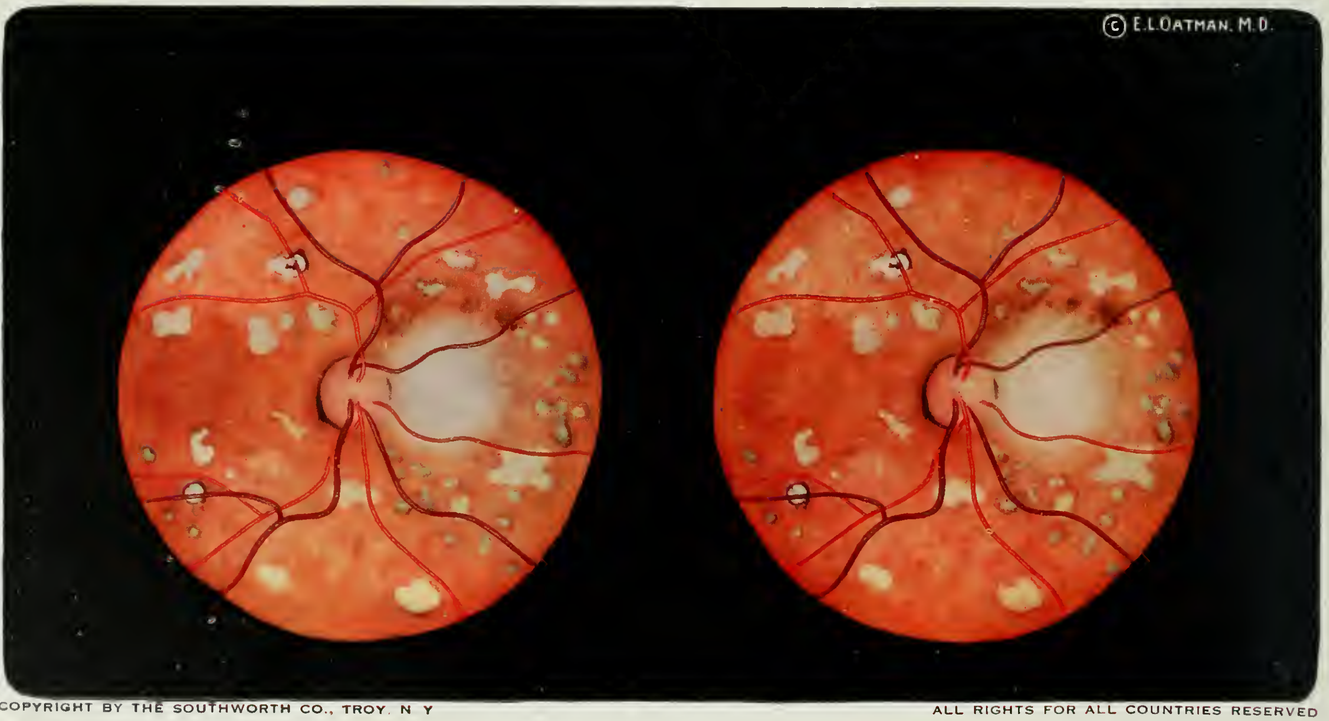


CHOROIDITIS DISSEMINATA

EXUDATIVE STAGE

RIGHT eyeground of girl, 15 years of age. Hereditary syphilis. Has saddle nose, notched incisors, scars at angles of mouth and arborescent corneal opacities characteristic of a preceding interstitial keratitis. Left eyeground is shown in stereogram 20. *Right eye.* Central vision 20/40. Has photopsiæ consisting of flashes of light, balls of fire, etc. Unable to see in a dim light (*torpor retinæ*). The entire fundus is covered with spots and plaques of disseminated choroiditis. Most of the lesions shown are in the stages of exudation or granulation, but those in the anterior zone of the fundus, which are not seen, are in the cicatricial stage. The field shown in the stereogram is covered with yellowish, softly outlined spots. Originally, all the spots were round, but some have coalesced and formed large patches with scalloped edges. Some spots show commencing pigmentation. The lesions are deeply situated and when in contact with retinal vessels, the latter pass over them. On the nasal side of the disc is a large area of opaque retina. The vessels which curve over its surface are about 0.5 mm. above the level of the disc. This opaque area is produced by a recent, profuse exudation from the choroid which has lifted and infiltrated the retina. The infiltration of the retina has extended along the nerve fibers to the disc obscuring its outline. This is a passive infiltration of the nerve fibers and not a true neuritis. The entire eyeground is mottled, suggesting foci of exudation in the deep layers of the choroid.

DIAGNOSIS: In most cases of chorioretinitis the presence of old choroidal cicatrices renders it easy to recognize the primary seat of disease. (See diagnosis stereogram 17). Rarely, chorioretinitis commences by a large subretinal effusion similar to that seen in this eye. In such cases the picture is not unlike that produced by closure of a branch artery (stergm. 45); (see diagnostic card No. 3).



CENTRAL EXUDATIVE CHOROIDITIS

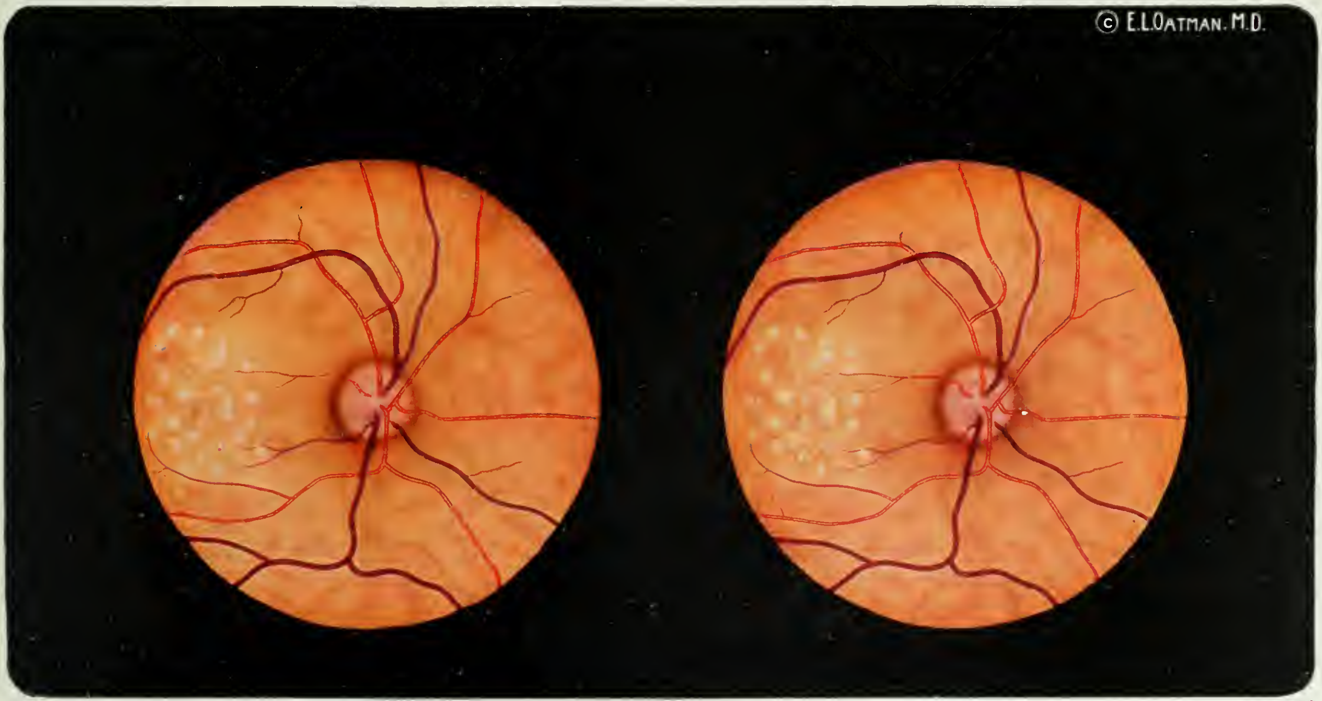
EXUDATIVE STAGE (SYPHILITIC)

RIGHT eyeground of a man, 30 years of age. Wassermann blood reaction for syphilis is positive. Acquired chancre ten months ago. Both eyes are uniformly affected. *Right eye.* Vision in full daylight is 20/70, but in a dimly lighted room it is but 10/200. He sees flashes of light and shooting stars, and objects appear to quiver. The anterior part of the vitreous contains fine, dust-like opacities. Dust-like vitreous opacities combined with choroiditis are regarded as pathognomic of syphilis. The optic nerve appears reddened and its margin blurred, appearances partly due to opacities in the vitreous. The retinal vessels appear normal. The macular region contains a group of small, rounded spots which show a tendency to coalesce. The older spots occupy the center of the group. They are whiter in color and sprinkled with fine pigment. The more recent spots, situated near the periphery of the group, are softly outlined, reddish-yellow in color and nonpigmented. The macular reflexes are abolished from swelling or exudation in the foveal depression.

Diagnosis: Aside from the positive evidence secured by the history and Wassermann test, syphilis is indicated in this case by the central location of the eruption and the vitreous opacities.

The eruption of a central choroiditis differs from Gunn's dots (stergm. 16) in that it affects vision and the lesions are larger, more distinct, more deeply situated and attended by pigmentation.

Colloid excrescences (stergm. 27) differ from central choroiditis as follows: they result from a chronic, degenerative process, usually senile; are unpigmented and cause no disturbance of vision.

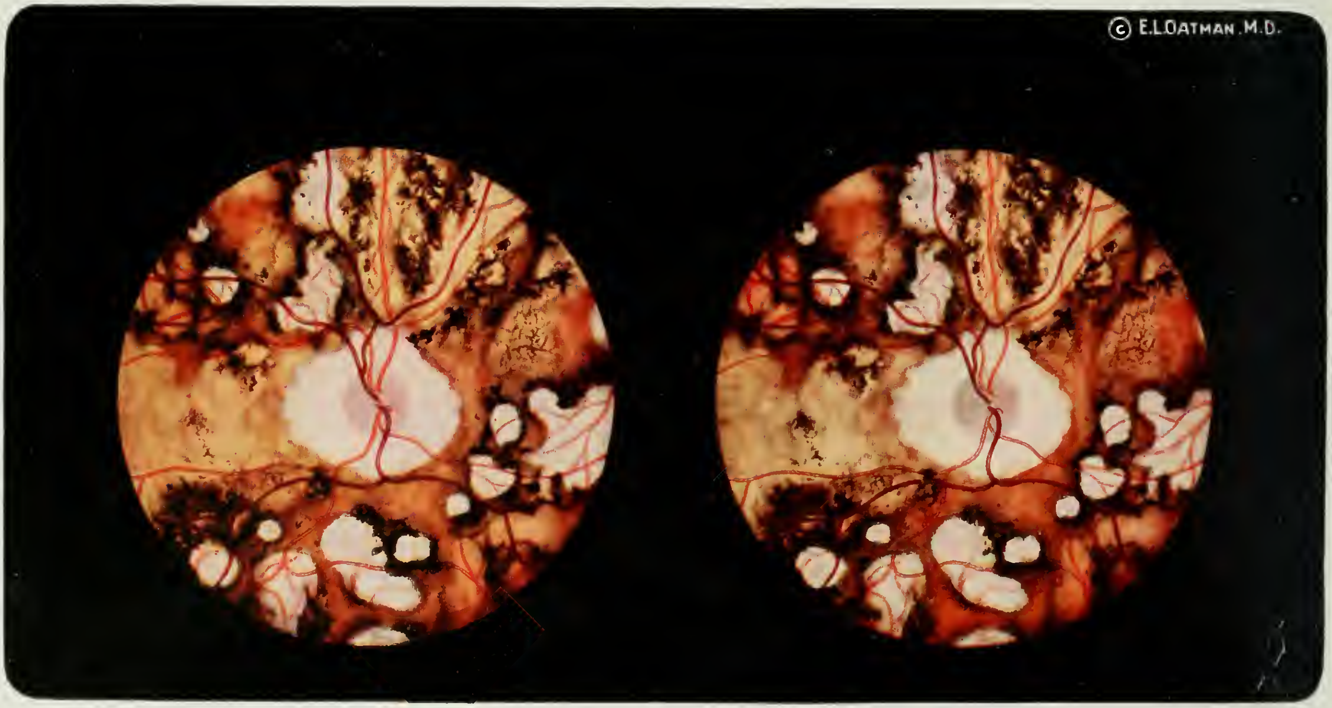


CHOROIDITIS DISSEMINATA

CICATRICIAL STAGE

LEFT eyeground of girl, 15 years of age. Has all the stigmata of inherited syphilis. Right eyeground is shown in stereogram 18. Left eye possesses only bare perception of light. Patient thinks vision was lost during an attack of keratitis six years ago. The vitreous is clear as is common in late choroiditis disseminata. The entire fundus is covered with cicatrices of exudative choroiditis. The disease has run its course and after destruction of the choroid and outer layers of the retina, the havoc has been repaired by formation of scar tissue. Complete atrophy of the choroid exists in the broad white zone about the optic disc. Extending outwards from the disc into the macular region is a broad, dirty-brown tract which, probably, marks the site of a previous subretinal exudation similar to that now existing in the left eye (stergm. 18). Enormous proliferation of pigment has occurred around the cicatrices denoting futile efforts of the pigmented epithelium to cover the defects. The optic nerve and retinal vessels are nearly normal, indicating that the inner layers of the retina have escaped atrophy.

Diagnosis: The ophthalmoscopic picture is typical of choroiditis and unlikely to be mistaken for any other condition. When choroiditis occurs in a myopic eye it is apt to be overlooked and the lesions attributed to myopia. In such cases, the diagnosis of choroiditis would rest upon the wide distribution of the lesions, excessive proliferation of pigment and eruptive character of the disease. Coloboma of the macula (stergm. 8), senile choroidal atrophy, posthemorrhagic and posttraumatic cicatrices, form single, local lesions, while the cicatrices of choroiditis are widely disseminated.

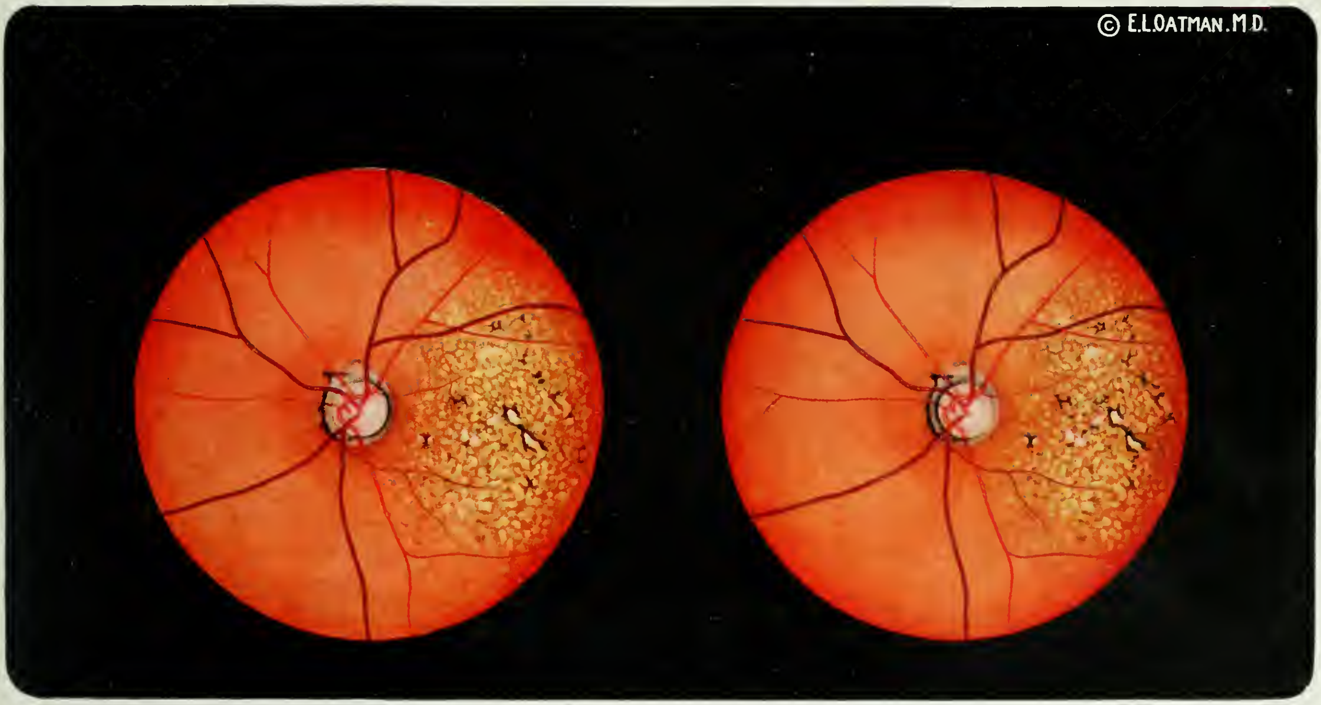


CENTRAL CHOROIDITIS

COMMENCING CICATRIZATION

LEFT eyeground of a man, 62 years of age. Contracted syphilis when 27 years old. Wassermann reaction, positive. Two years ago, developed persistent headache and vomiting, which disappeared under antisyphilitic treatment. Deterioration of vision began six months ago and vision now is 10/200 in each eye. Sees best in a dim light (nyctalopia), scarcely at all in sunlight. Irregular central scotomata and concentric contraction of visual fields. The temporal central quadrant of the fundus is riddled with small, closely aggregated lesions of exudative choroiditis. In the center of the diseased area are several cicatricial spots, encircled by pigment. Evidently, the disease is spreading peripherally, as shown by groups of recently developed, pink colored, nonpigmented spots. Several superficial, coal-black, branching figures and specks are seen in front of the eruption. These are formed by pigment from the tessellated epithelium which has been carried into the inner layers of the retina. The optic nerve presents the picture of postinflammatory atrophy, i. e., the disc is white, the lamina cribrosa is obscured, the retinal vessels are narrowed and the nerve is surrounded by a ring of atrophic choroid.

Diagnosis: The ophthalmoscopic diagnosis in this case would lie between central choroiditis and senile degeneration with colloid excrescences (stergm. 27). In central choroiditis the lesions are deeply situated, vary in shape and size and tend to coalesce. The presence of white, pigmented cicatrices is positive evidence of a choroidal origin. Colloid excrescences are very superficially situated, uniform in size, of a light amber color, nonpigmented and do not coalesce.

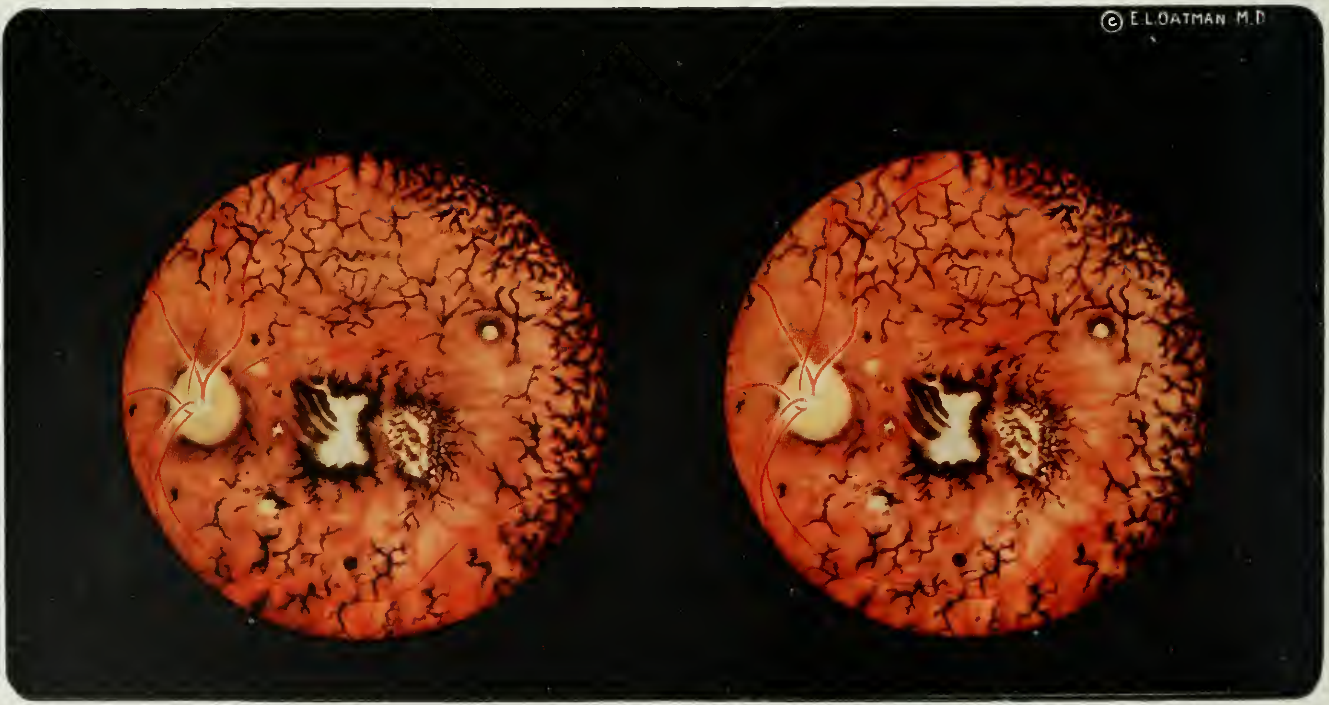


CHORIORETINITIS PIGMENTOSA

RETINITIC OPTIC ATROPHY

LEFT fundus oculi of boy, 17 years of age. Father contracted syphilis and infected mother five months before patient's birth. Patient presents the stigmata of congenital syphilis. Both eyes affected with chorioretinitis. Cannot see well in a dim light. *Left eye.* The retina is profusely pigmented. The pigment is situated in the inner layers, as shown by its branching coral-like form and tendency to cover the retinal vessels. The pigment figures are most numerous at the equator where they form a continuous network. Pigment emigration in this fundus was caused by diffuse disease of the inner layers of the choroid. The outer layer of large vessels is affected only in certain limited areas where the entire thickness of the choroid is replaced by white cicatrices. Two of the larger scars send prolongations out over the surface of the retina. The small, round, black spot in the lower part of the picture represents a cicatrix in which the retinal epithelium has succeeded in completely covering the defect. The optic nerve has the dirty, yellowish-white color characteristic of post retinitic atrophy. The retinal vessels are reduced to mere threads. On and near the disc the vessel walls are white. The entire disc appears obscured as by a thin veil.

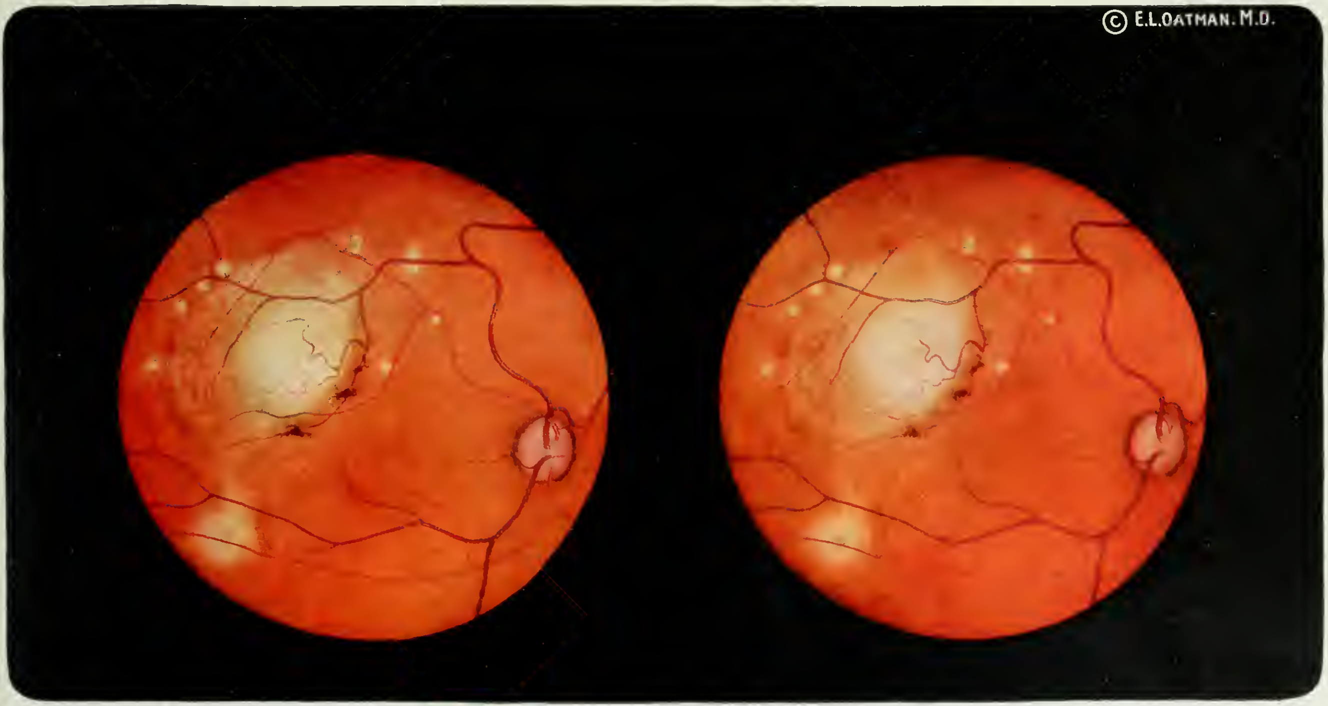
DIAGNOSIS: This affection is frequently mistaken for retinitis pigmentosa (stergm. 53). In this particular case the presence of choroidal cicatrices would prevent such an error. Frequently, however, the resemblance is so close that differentiation is extremely difficult. In all doubtful cases, the blood reaction for syphilis should be employed. See diagnostic card No. 3.



TUBERCULOSIS OF THE CHOROID

RIGHT eyeground of a man, 21 years of age, with tuberculosis of the choroid. The stereogram was made four months after treatment was begun and convalescence well advanced. The disc is reddened. Retinal vessels normal. Just beyond and slightly above the macula is a round, yellowish-white patch with a diameter about three times that of the disc. It is surrounded by a number of similar but much smaller spots. All other parts of the fundus are free from disease. The lesions described are supposed to be a herd of tubercles. The large spot has a well defined, soft outline. The retinal vessels which cross its surface are elevated about .5 mm. above the level of the surrounding fundus. The surface of the patch is unpigmented, but along its inner border pigment has emigrated and settled around the descending macular vein. Beyond the outer border of the patch the retinal pigment is thinned, exposing the choroidal vessels. The smaller deposits resemble the large one.

Diagnosis: The best evidence that choroiditic spots are tubercular is a coexisting miliary tuberculosis or tubercular meningitis. In suspected solitary tubercle a marked reaction in the affected eye to an injection of tuberculin is regarded as positive evidence that the affection is tubercular.

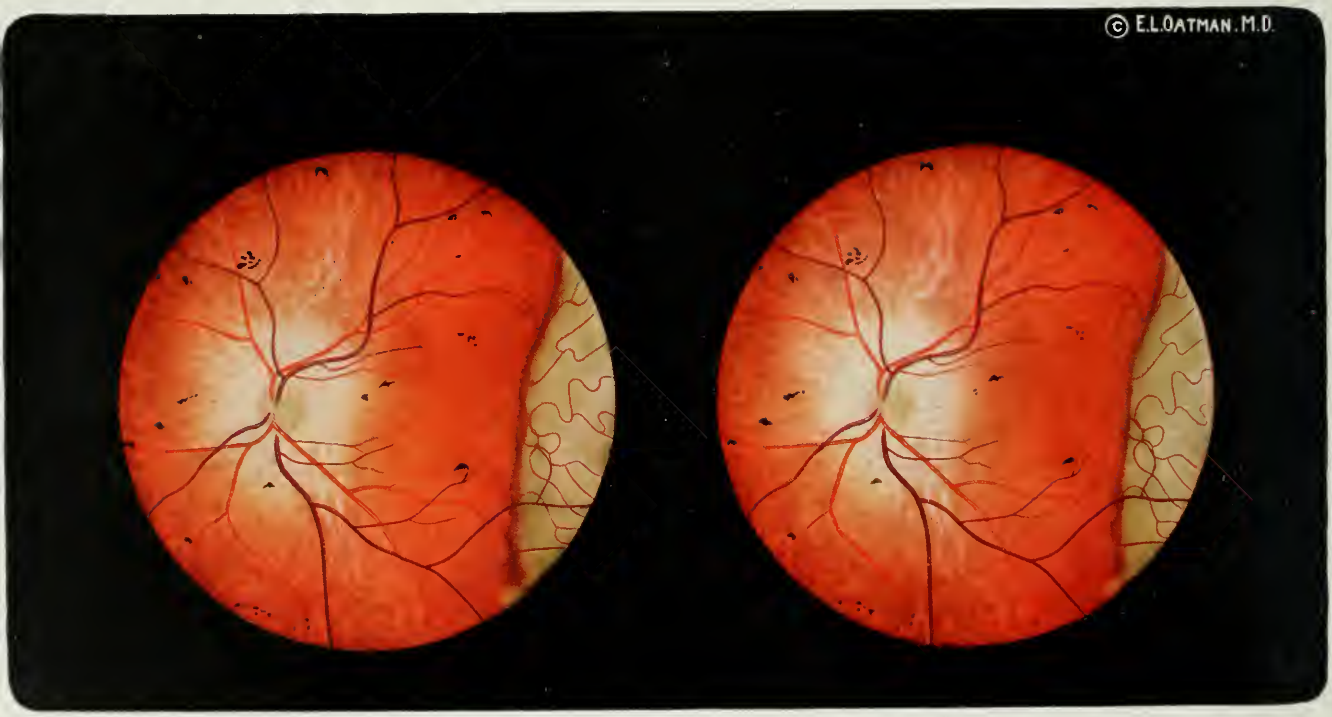


DIFFUSE CHORIORETINITIS

ATROPHIC STAGE

THE ophthalmoscopic picture is that of wide-spread vascular degeneration of the choroid and moderate atrophy of the retina. Except in the macular region, the epithelium has lost its pigment, thereby exposing the vessels of the choroid. A few masses of this pigment are scattered throughout the retina. The disc is surrounded by a broad, white area in which the choroid has undergone extreme atrophy. In nearly all cases of wide-spread atrophy of the choroid the process is farthest advanced around the nerve. The reason for this is not altogether clear, although it may be due to the close adhesion between choroid and sclera that normally exists in this region, while elsewhere the two membranes are separated by lymph spaces. The retina is somewhat atrophic as shown by pigmentation, slight narrowing of the retinal vessels and, especially, by yellow atrophy of the nerve.

Diagnosis: The cause of choroiditis in this eye was not ascertained. Whatever the toxin, it was no longer active when the patient came under observation. Syphilitic choroiditis usually, but not invariably, affects both eyes. Ocular tuberculosis, on the other hand, generally is unilateral, and it is not improbable that this is a picture of healed tuberculous lesions. I saw a similar eyeground in a young woman, in which tuberculosis developed in an old cicatricial patch. This form of choroiditis differs from choroiditis disseminata in being unilateral and nonprogressive, also by its patchy, irregular distribution.

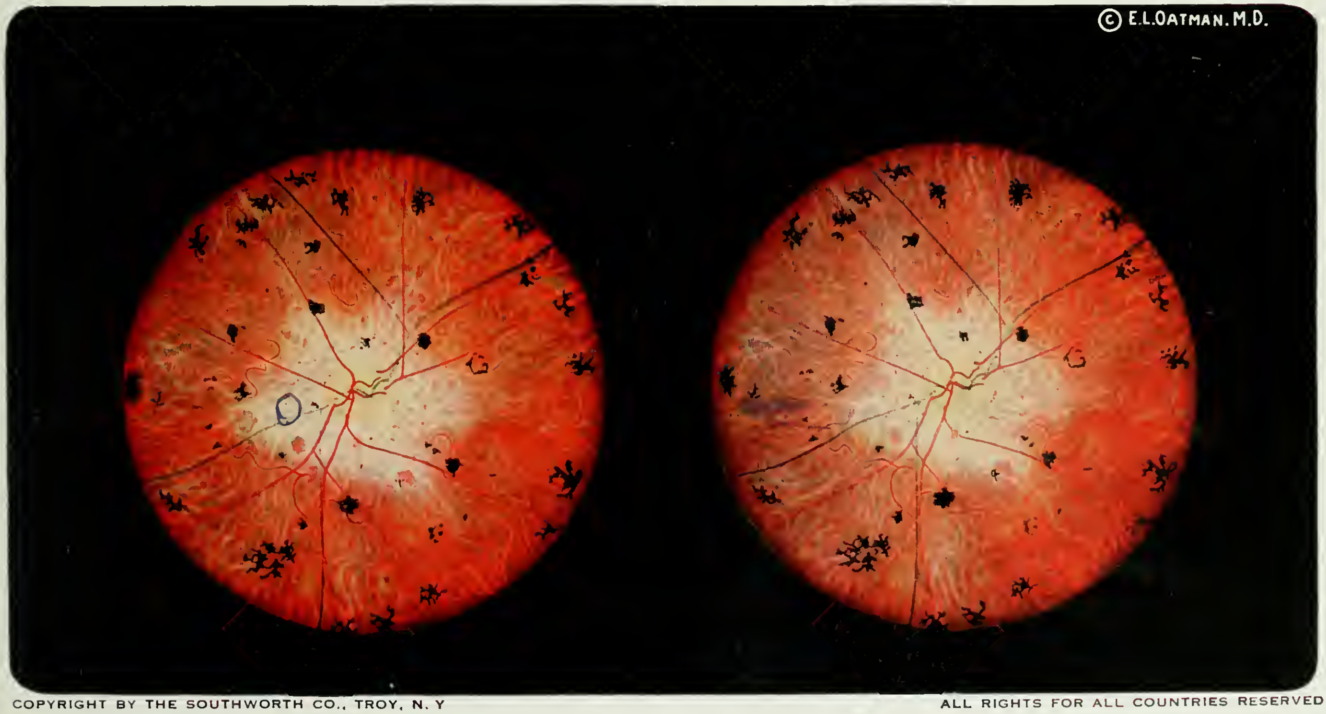


VASCULAR DEGENERATION OF CHOROID

SYNONYM: SCLEROSIS OF THE CHOROID

RIGHT eyeground of a man, 32 years of age. Six years ago a violent blow on the right brow produced complete and permanent blindness. It is probable that an orbital fracture occurred which extended through the optic canal, lacerated the optic nerve and, in some way, closed the ophthalmic artery, thereby interrupting the blood supply to the choroid and retina. The ophthalmoscopic picture is the same as that following optico-ciliary neurectomy. The vessels of the choroid are highly sclerosed but not entirely bloodless. Degeneration is farthest advanced around the disc where the vessels are converted into white strands of connective tissue. At the equator the fundus presents a red reflex. The retinal epithelium has parted with much of its pigment, some of which has emigrated and formed spider-shaped figures on the surface of the retina. The inner layers of the retina are known to be highly atrophic by the extreme narrowing of the main vessels and disappearance of all small branches. The optic nerve is very atrophic, sharply outlined and slightly excavated. It is unusual to see complete excavation of the disc in a nonglaucomatous eye, but in this case it is legitimately due to extreme atrophy and contraction of the nerve.

Diagnosis: In this eye, sclerosis of the choroid is so prominent that the atrophy of nerve and retina might be overlooked. The absolute blindness of the eye and extreme atrophy of the nerve suggest traumatism. The condition differs from senile degeneration in its wide extent and limitation to one eye. The lesions of exudative choroiditis (stergm. 20) are "patchy," more deeply situated and richly pigmented. The condition could scarcely be mistaken for albinism (stergms. 15–26). Moreover, in none of the conditions mentioned is the eye completely blind.

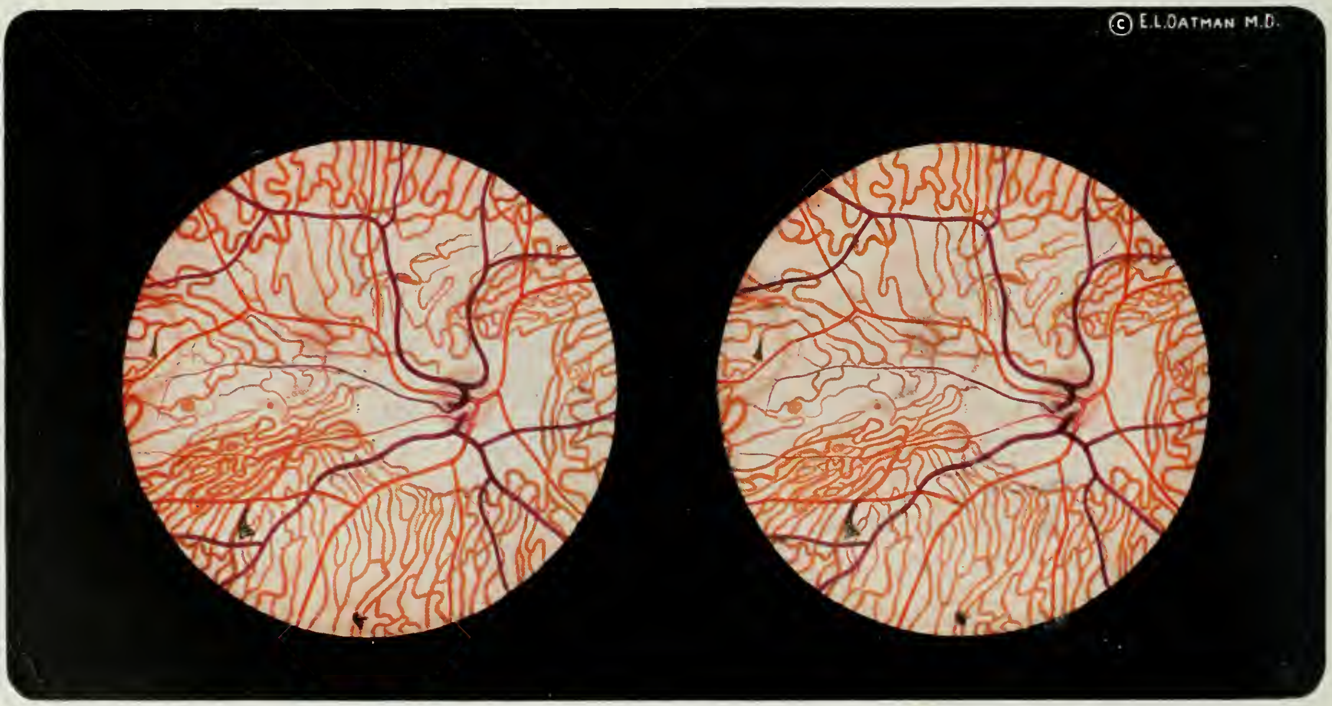


ATROPHY OF THE CHOROID

ACQUIRED ALBINISM OF THE EYEGROUND

WOMAN, 53 years of age. Urine contains 9 per cent. of sugar. Always had good vision until two years ago, when it began to fail in both eyes. Right eye counts fingers at three feet. There is almost complete depigmentation of the fundus. The choroidal vessels appear with great distinctness against the uncovered sclera, producing a picture closely resembling that of albinism. The choriocapillaris and medium sized choroidal vessels have disappeared from large areas, which now present a white reflex. Evidently, these choroidal vessels have been obliterated by a simple atrophic process, inasmuch as no evidence of inflammatory action exists in the eye. The retinal vessels appear normal. The disc shows no signs of disease, although it appears ill-defined, as in all cases where it is no longer contrasted with the choroid.

Diagnosis: This rare fundus condition is presented for comparison with other forms of choroidal atrophy, from which it is differentiated chiefly by translucent atrophy of the vessels and destruction of pigment. It is distinguished from congenital albinism (stergm. 15) by recent failure of vision, normal pigmentation of other parts of the eye and body, and by atrophy of the choroidal vessels. The eye of an albino is normal except that it contains no pigment.

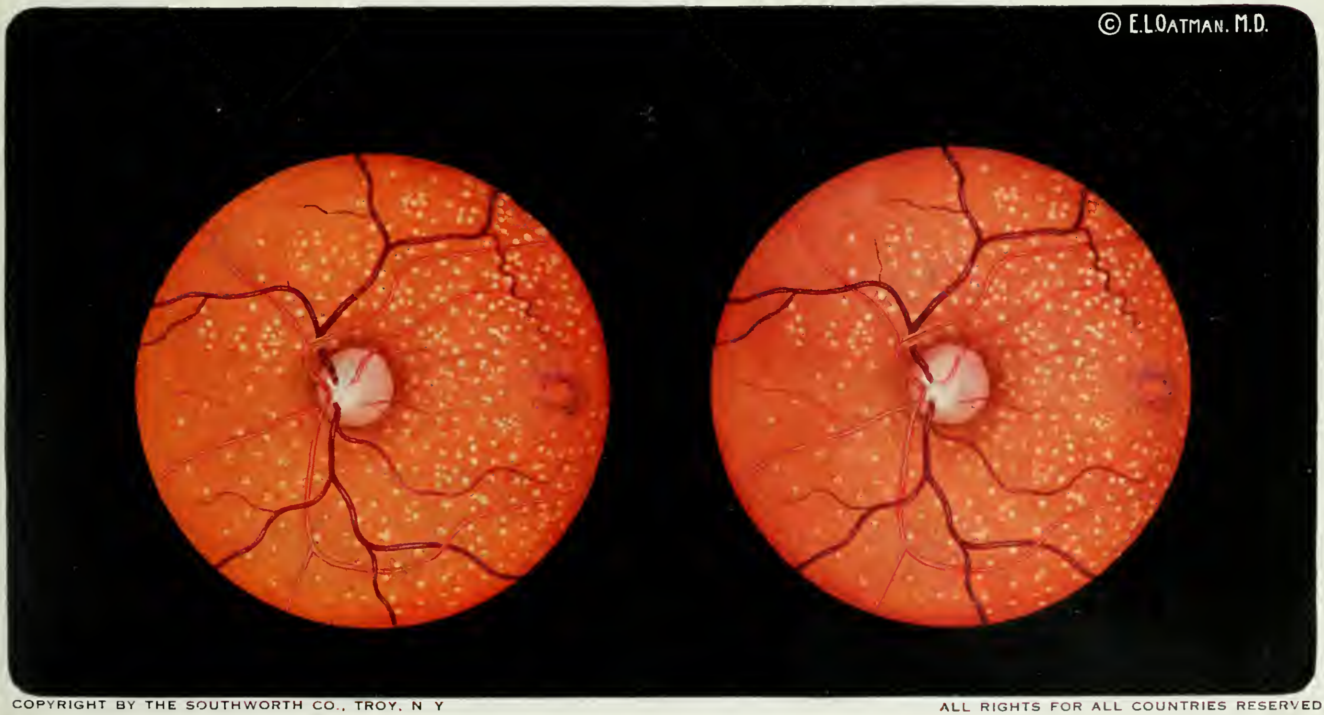


SENILE CHANGES IN THE FUNDUS

COLLOID EXCRESCENCES (*Drusen*). MACULAR DEGENERATION. ARTERIOSCLEROSIS

LEFT eyeground of a woman, 73 years of age. Similar fundus conditions present in both eyes. Vision 20/50. The region about the nerve and macular is covered with superficially situated, round, yellowish dots, none of which exceeds in size the width of the central vein. They are confined to the posterior polar zone and occur chiefly on the temporal side of the nerve. They occur singly and in groups, but show no tendency to coalesce. They are always below the level of the retinal vessels, but some of the larger dots appear elevated. Neither the dots nor the surrounding fundus is pigmented. At the macula the foveal pit is surrounded by a ring of fine, granular pigment. The nerve contains a deep physiologic excavation. Arteriosclerosis of the retinal vessels is indicated by undue brightness of the central light streak on all arteries and, particularly, by the white walls seen on an ascending artery as it crosses a vein. All the morbid changes observed in this eye are degenerative in character and incident to old age.

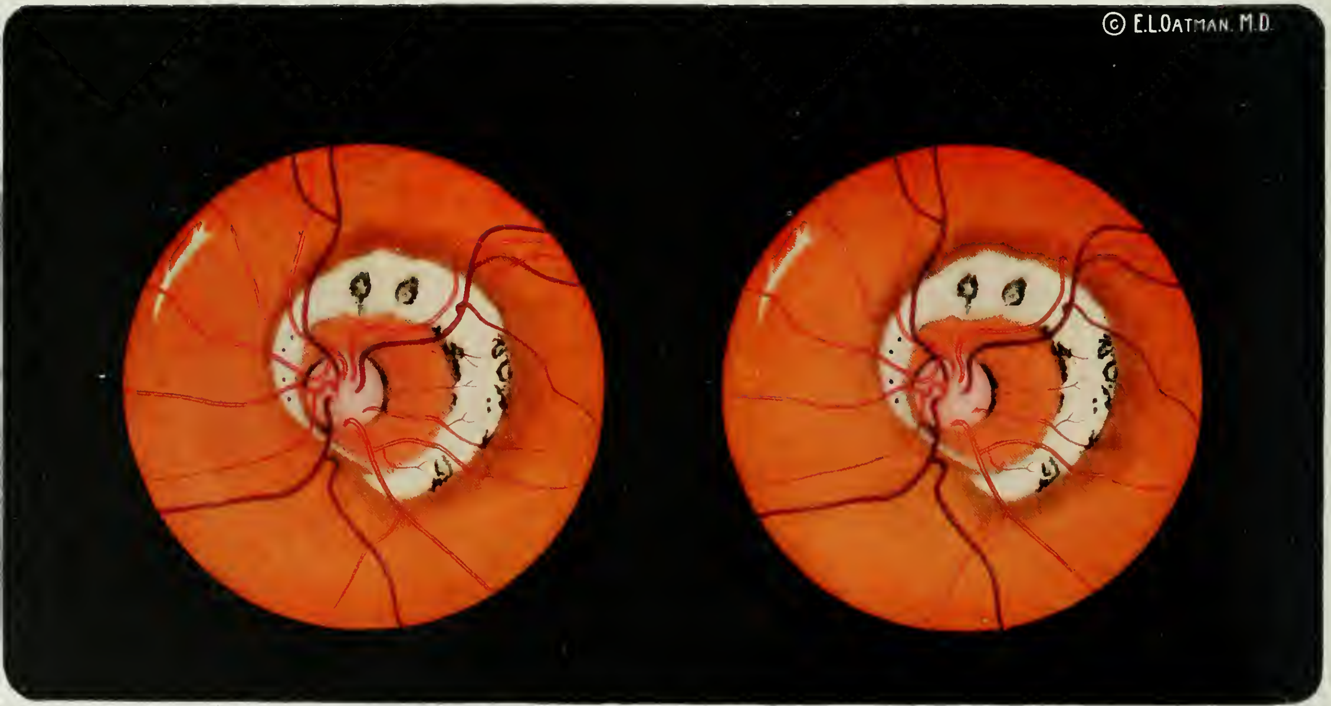
DIAGNOSIS: A punctate condition of the fundus, limited to the posterior pole and occurring in an aged person, is due, presumably, to colloid excrescences. Other conditions are differentiated as follows: Gunn's dots (stergm. 16) occur in the young, are smaller in size and less distinct than colloid bodies. Retinitis punctata albescens (stergm. 54) commences in early life, is slowly progressive and associated with night blindness and atrophy of the retina. The lesions of central choroiditis (stergms. 19, 21) are recognized by their inflammatory character, deep situation, large size, irregular shape, presence of pigment and tendency to coalesce.



RUPTURE OF THE CHOROID

LEFT eyeground of a boy, 10 years of age. One year ago the eye was struck by a missile from a sling. At that time, the fundus was obscured by blood in the vitreous. The stereogram shows the condition of the fundus twelve months after the injury. The blood has been completely absorbed from the vitreous, leaving the media clear. An unusually extensive rupture of the choroid is seen completely encircling the nerve. Probably, the laceration commenced between the disc and macula, but was prolonged far beyond the usual length. Observe the tendency for the rupture to approach the nerve. The course of the rupture is concentric with the outline of the disc. In shape it is wide in the center and narrower at the ends. In the supranasal region is a smaller rent in the choroid with a lateral extension and forked extremity. The retina is not torn, as shown by its vessels which pass uninterruptedly across the ruptures. Around the rupture the retina is darkened by fine, dust-like deposits. Along the edge and upon the surface of the exposed sclera are masses of pigment, which will progressively increase in amount.

Diagnosis: The typical cicatrix of a ruptured choroid is recognized by its crescentic form and by its situation, which is concentric with the outline of the optic disc. Neither coloboma of the choroid (stergm. 6–8) nor the cicatrices of disease assume this peculiar shape.

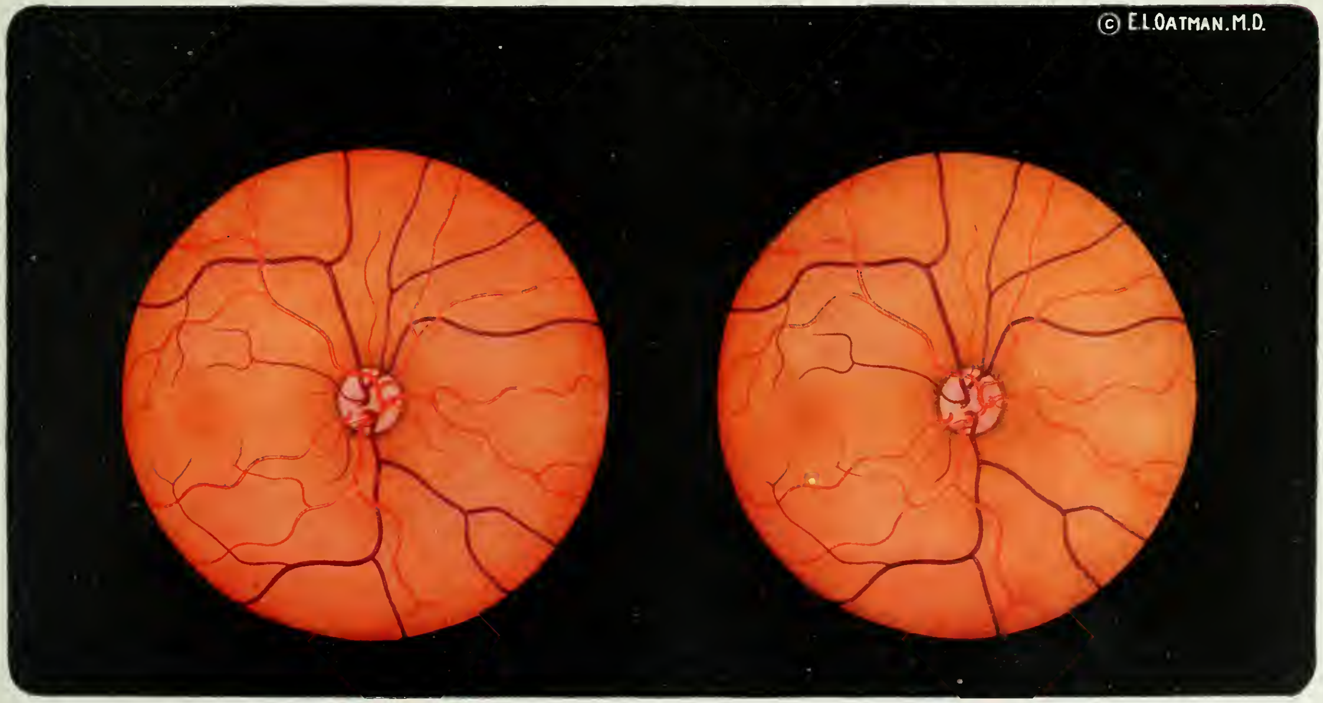


DIFFUSE RETINAL ARTERIOSCLEROSIS

PRIMARY STAGE

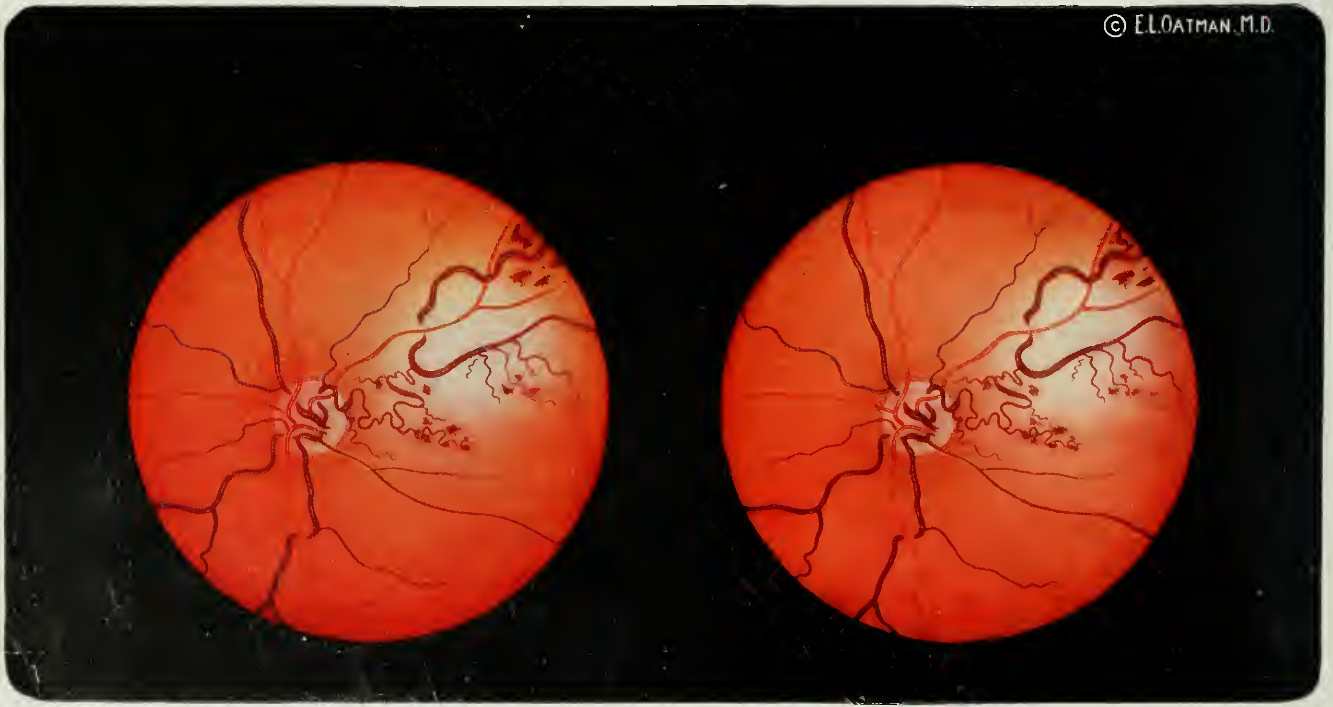
BOY, 15 years of age. Sought advice because of recurring epistaxis. Incidentally, the eyes were examined when a probable cause for the bleeding was discovered in the condition of the blood vessels. The retinal arteries were slightly dilated and more tortuous than the veins. The smaller vascular twigs were very distinct. The arterial blood columns had extremely delicate white borders, evidently due to slight opacity of the walls. The most conspicuous feature in the fundus was a strong arterial pulse, especially pronounced wherever an artery made a sharp bend. The veins were of normal size and not unduly tortuous. The disc was uniformly reddened. The urine contained a trace of albumin and hyaline casts. Heart moderately dilated. Blood pressure was 120 mm. Hg.

The first ophthalmoscopic evidences of arteriosclerosis in the retina are dilation, tortuosity and pulsation of the arteries. The pulsation is most marked at bends and curves and, when present, is unmistakable. It is characterized by a lateral displacement of the whole vessel and hence is termed *locomotion pulse.* Locomotion pulse occurs in all cases of incipient arteriosclerosis in which the arteries are primarily affected, but as it causes no disturbance of vision it is seldom seen by ophthalmologists. As vascular degeneration progresses the arteries become rigid and arterial pulsation disappears. Locomotion pulse must be distinguished from the pressure pulse seen in glaucoma and whenever general blood pressure sinks below intraocular pressure.



ADVANCED RETINAL ARTERIOSCLEROSIS

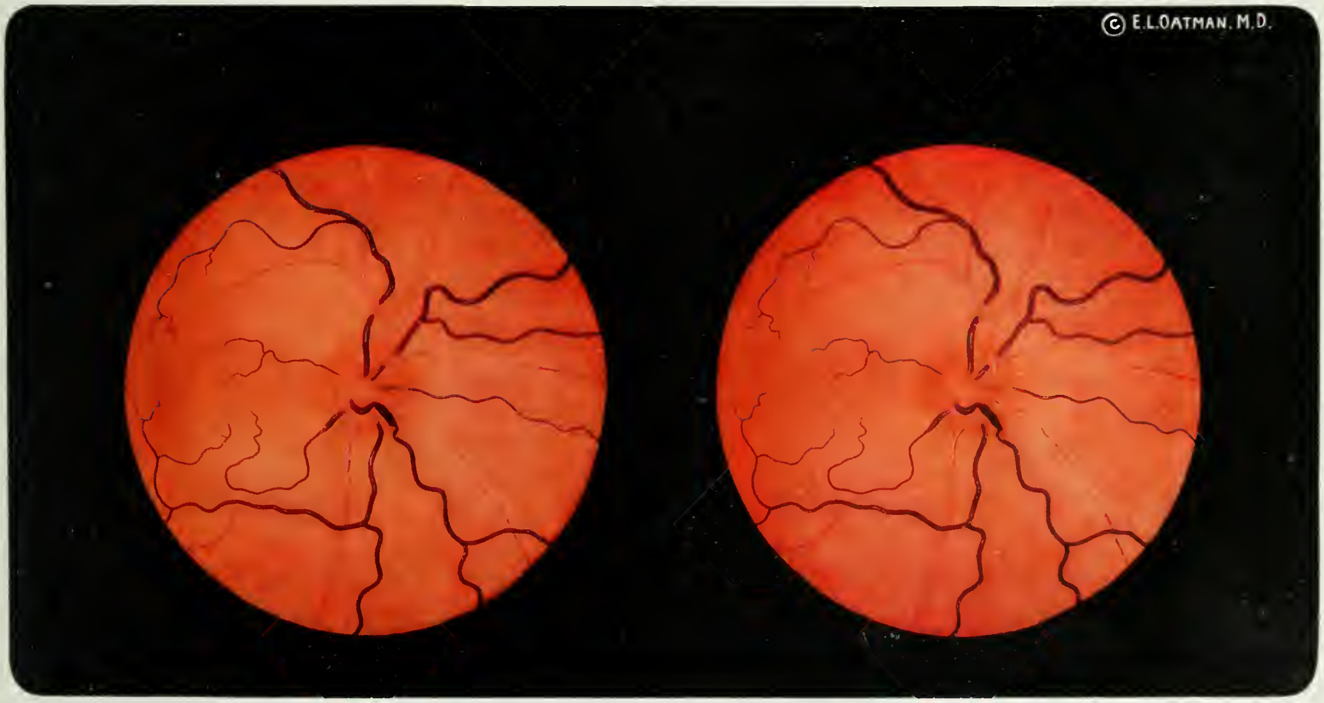
LEFT fundus oculi of a laboring man, 59 years of age, with advanced general arteriosclerosis. Urine normal. Arteriosclerotic changes are pronounced in the retina. The disc has a reddish color. The arteries are narrowed but not tortuous. The primary subdivisions of the central artery show thickened but translucent walls which obscure underlying veins; the walls of the artery, however, are not visible with bright illumination. This form of mural thickening is supposed to indicate endothelial proliferation in the artery. The veins are tortuous, dilated and broadened peripherally. In passing below a sclerosed artery they appear narrowed and disappear. The blood column of the inferior temporal vein is irregularly narrowed and bordered by white lines. Such linear opacities are situated in the outer wall of the vessel, showing that the media and adventitia are sclerosed. The most conspicuous changes are found in the superior temporal vein, which is extremely tortuous and greatly narrowed between the disc and point of bifurcation. This narrowed stretch, however, contains several ectasiæ. Beyond the point of bifurcation the branches of the vein are abruptly and enormously dilated. A number of small collateral veins have developed along the constricted portion. Throughout the area to which this obstructed vein is distributed, the retina is opaque and contains old and recent hemorrhages.



ARTERIOSCLEROSIS AND NEURITIS

RIGHT eyeground of a man, 49 years of age, with general arteriosclerosis. He is very muscular and works in a foundry where he is accustomed to carry heavy weights. Takes several alcoholic drinks daily. Blood pressure 260 to 275 mm. Hg. Urine contains a trace of albumin. Vision 20/20. Advanced arteriosclerosis of the retinal vessels in both eyes. The optic disc is very red, slightly elevated, and its outline is obliterated. The retinal arteries are pale in color, pursue a straight course and are irregularly narrowed. The veins are tortuous, dilated and appear to be interrupted wherever they are crossed by an artery. The arterial walls exhibit both visible and translucent sclerosis. The blood columns of certain arteries are completely hidden for short stretches by opacity of the walls. The inferior nasal artery contains several slight, fusiform dilations, alternating with sharp constrictions in which the blood column is reduced to a mere thread. The venous terminals are extremely tortuous. Varicose dilations (phlebectasiæ) exist on the veins below the disc.

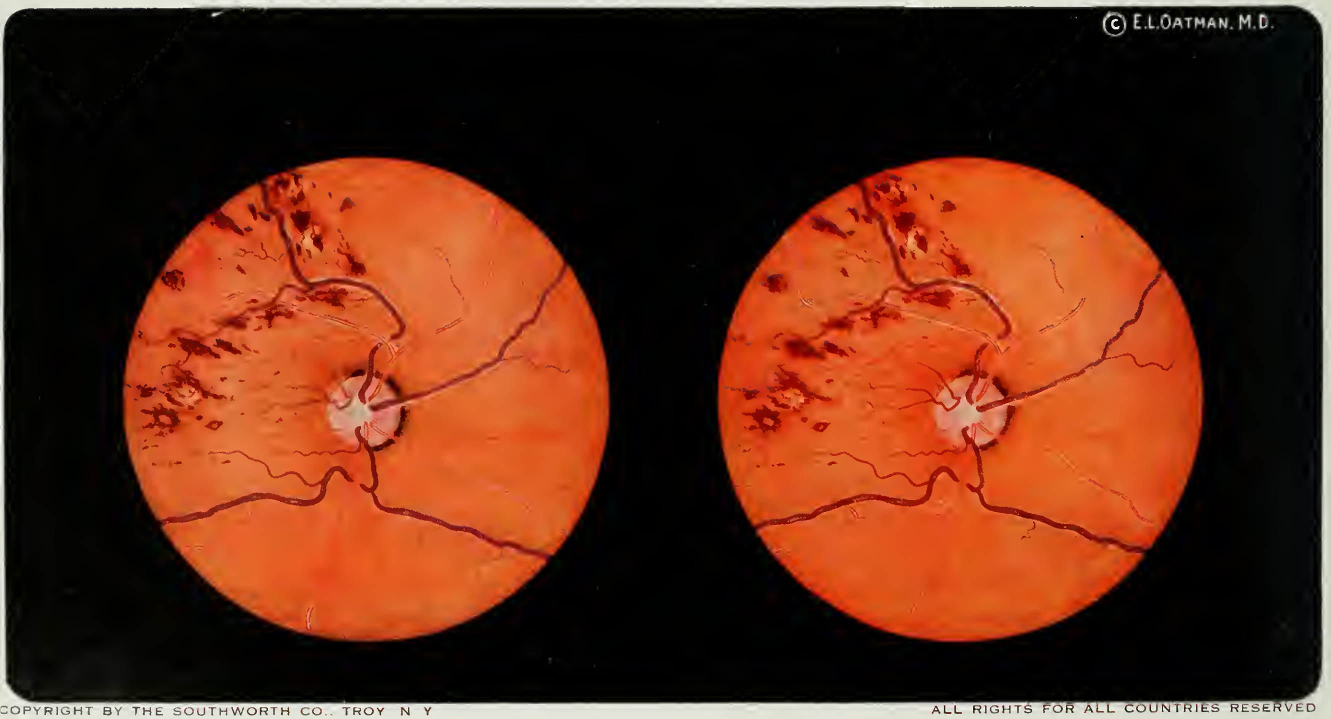
Diagnosis: The sclerosed vessels in this fundus furnish a key to the correct diagnosis. The condition is one of angiopathic disease identical with that which occurs in nephritis, and there is no doubt that vascular degeneration exists also in the kidneys which, when farther advanced, will cause this case to be classed as one of albuminuric retinitis. In pseudoneuritis (stergm. 13) and in congenital cyanosis (stergm. 58) both arteries and veins are tortuous and there is no angiosclerosis. In choked disc (stergms. 63, 64, 65, 66) the nerve head is edematous and greatly swollen. True optic neuritis may, however, be due to arteriosclerosis.



ARTERIOSCLEROSIS WITH HEMORRHAGES

RIGHT eyeground of a man, aged 47 years. Works in a brewery, where he performs heavy manual labor. Consumes great quantities of beer daily. Blood pressure, 190 mm. Hg. Urine contains albumin and casts, but specific gravity, quantity and urea content do not indicate advanced degeneration of the kidneys. In the right eye, central vision was suddenly lost about one month ago. Eye tension is not unduly increased. The retinal vessels are extensively diseased. There is physiologic excavation of the disc, but no neuritis. The macular and supratemporal regions contain numerous small, striate hemorrhages. Most of the extravasations are recent, but some exhibit the yellowish-white patches of partial absorption and degeneration. Bleeding has occurred principally along the course of the superior temporal vessels, but no special point of closure appears in the veins. No exudates are seen. The arteries are irregularly narrowed and bordered by white lines. Several small, white plaques of degeneration appear in the wall of the inferior temporal artery. A crossing artery indents and obscures an underlying vein in the manner characteristic of arteriosclerosis. The veins are white bordered, tortuous and alternately constricted and dilated. The venous terminals are unduly prominent and tortuous. The inferior temporal veins are wider at the periphery than at the disc.

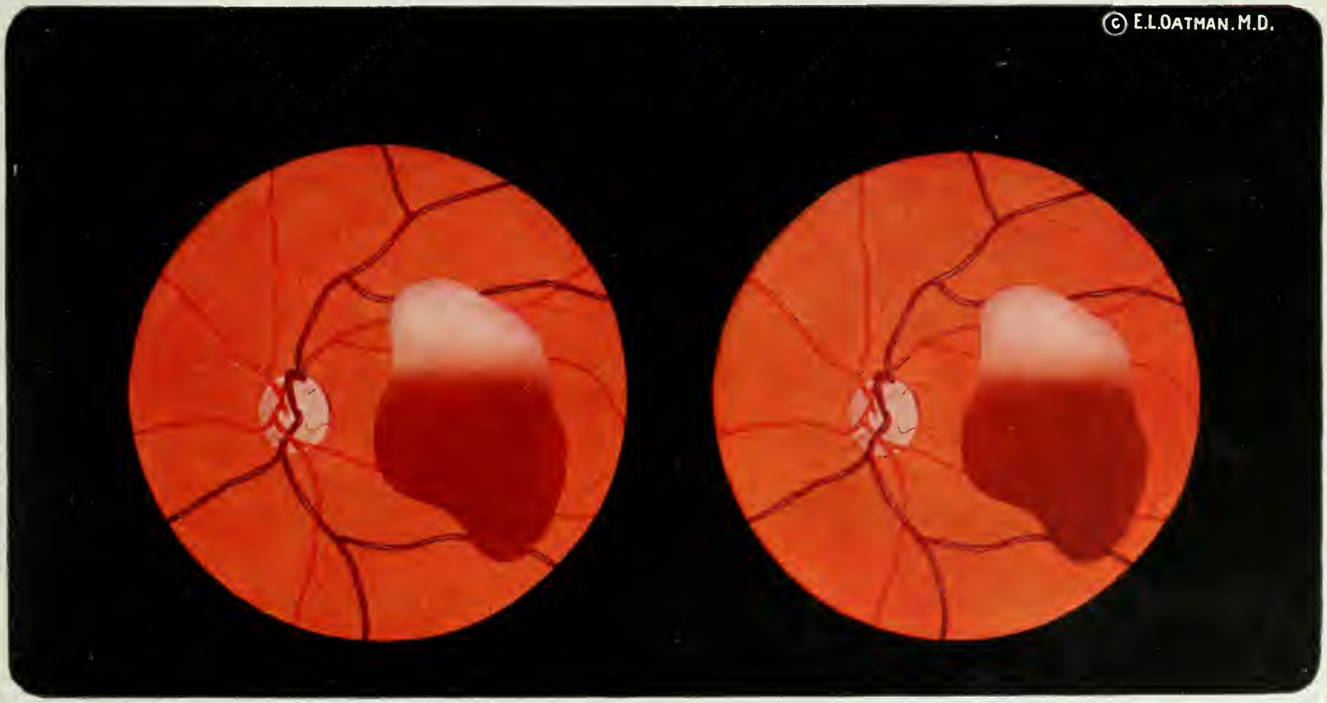
Diagnosis: The vascular changes described above are sufficient to establish the diagnosis of arteriosclerosis.



PRERETINAL (Subhyaloid) HEMORRHAGE

WOMAN, aged 29 years. She is an ill-nourished, sweat-shop seamstress. About one month ago, while bending over her work, a cloud suddenly appeared before the left eye, which completely abolished central vision. With the ophthalmoscope an enormous extravasation of blood is seen covering the entire macular region. It lies on the surface of the retina in front of the vessels, is slightly elevated with sharply defined outline. The lower portion of the hemorrhage consists of a dark red clot and the upper portion of very light-red plasma. The retinal vessels present no positive evidences of sclerosis. Physical examination fails to demonstrate either syphilis or tuberculosis.

Diagnosis: A preretinal blood clot is almost unmistakable. Detachment of the retina is lighter in color, more elevated and not so sharply defined. Hemorrhage is distinguished from intraocular tumors by its abrupt development, red color and slight elevation.

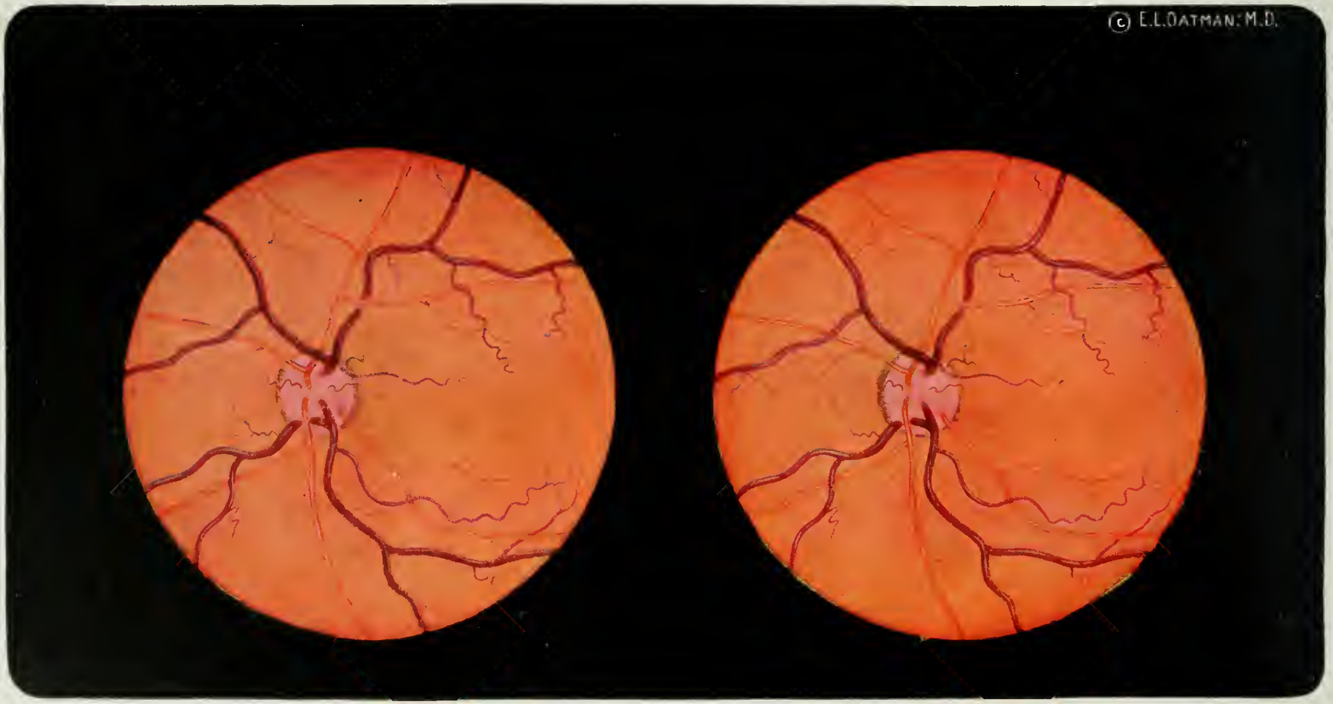


ANGIOPATHIC RETINITIS

PRECURSORY STAGE

LEFT eyeground of a laborer, 53 years of age. Addicted to the immoderate use of alcohol and tobacco. Blood pressure 190 mm. Hg. The urine contains neither albumin nor casts, but the percentage of urea is low. Has persistent, dull headache. Fundus conditions are similar in each eye. The optic disc has a brick-red color. The retinal arteries pursue a straight course. Their axial light streak is very bright and well defined, producing the effect known as "silver wire arteries". The walls of the arteries are not visible, but that they are sclerosed is demonstrated by the manner in which they indent underlying veins. The larger veins are widened and tortuous and their light streaks are pronounced. The small vessels around the disc and throughout the fundus are unduly distinct and their terminals twisted.

Diagnosis: This is an example of retinal arteriosclerosis in the early stage of rigidity. It is termed "precursory" or "prealbuminuric" because in the great majority of cases it is followed or attended by chronic nephritis. The important diagnostic features are the twisted venous terminals, strong central light streaks on the vessels and, especially, indentation of a vein by an overlying artery.

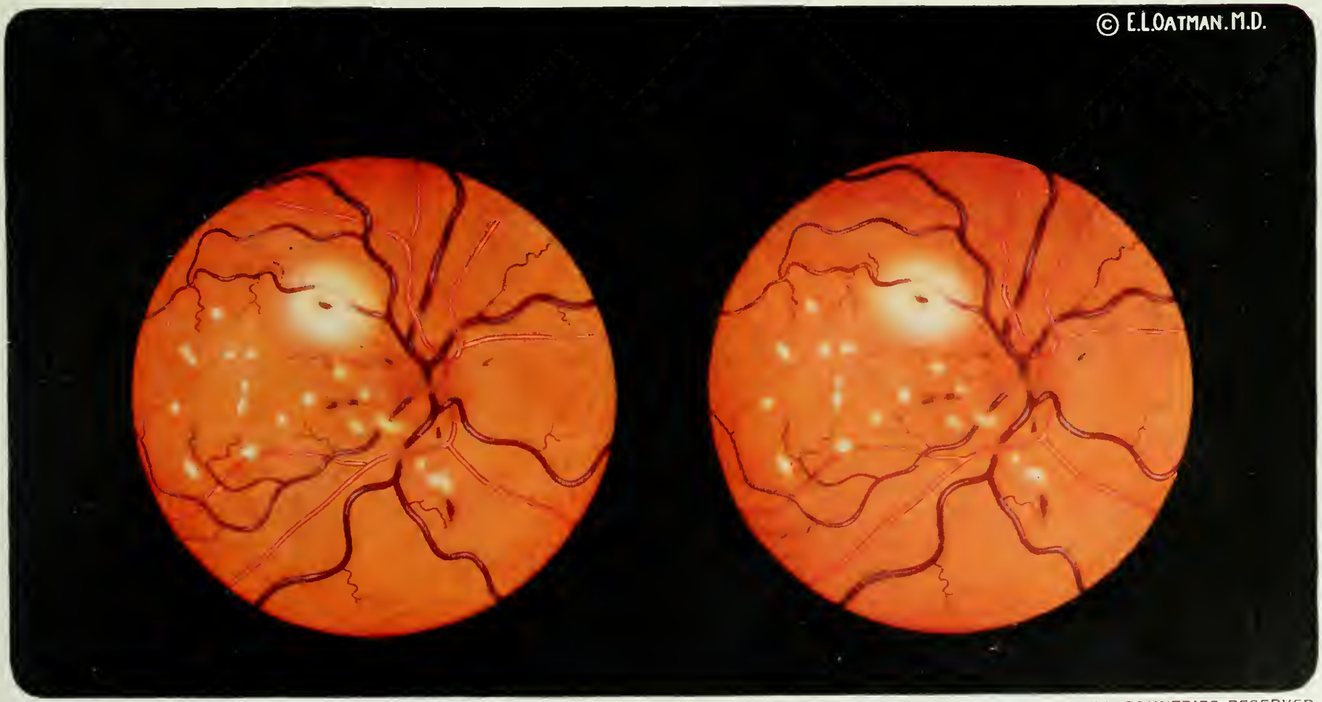


ANGIOPATHIC ALBUMINURIC RETINITIS

EXUDATIVE STAGE

RIGHT eyeground of a man, 37 years of age. He has advanced chronic interstitial nephritis. One month ago he first noticed obscuration of vision in both eyes. The fundus of the right eye presents an exceptionally characteristic picture of angiopathic retinitis in the exudative stage. The nerve is intensely red and its outline is obscured, but swelling is not demonstrable with the opthalmoscope. The arteries possess a very bright central light streak and their walls hide underlying veins. The veins are somewhat dilated and tortuous, the tortuosity being particularly marked in the venous terminals. The disc is surrounded by a number of small striate hemorrhages. On the temporal side of the nerve, the retina contains numerous small, superficially situated fluffy exudates, some of which cover the retinal vessels. The supratemporal vein is surrounded by a large exudation in the center of which is a small extravasation of blood.

Diagnosis: That the pathologic process in this fundus is an angiopathic retinitis is indicated by the red nerve, congested blood vessels, hemorrhages and superficial exudates which overlie the vessels. Choroiditis may be excluded, inasmuch as no deeply situated, pigment-bordered spots are present (stergms. 17–18–20). The absence of flat, sharply outlined plaques of degeneration, macular star, etc., proves that the retinitis has not as yet entered the stage of degeneration.



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